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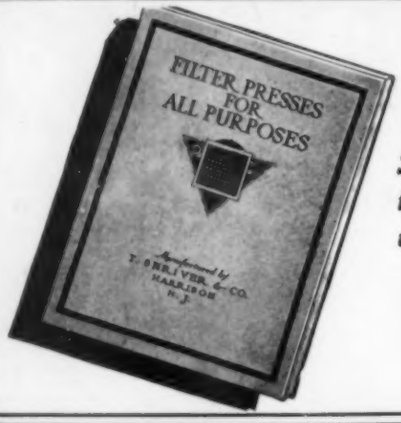


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McGRAW-HILL COMPANY, INC.
JAMES H. McGRAW, *President*
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H. C. PARMELEE
*Editor*

Volume 32 — New York, February 2, 1925 — Number 5


## Important If True

PROSPECTIVE building construction for 1925, as forecast by the *Architectural Forum*, will about equal the record construction of 1924. This is of great interest to chemical engineers; for many commodities with the production of which they are concerned, such as paint, varnish and roofing, are again to be in great demand.

In the detailed estimates of construction in various fields, there is an item of particular interest to chemical engineers who are engaged in consulting practice. Reference is made to the forecast of increased industrial construction. This particular field promises to make a substantial gain over the construction of the past year and, although the estimate does not differentiate among the various industries, it is reasonable to suppose that at least some of this increase will be in the field of the chemical engineering industries.

If such is the case, it will be a welcome change indeed for the consultant. Since the boom days immediately following the war there has been but little to occupy his energy and talent. Let us hope that at last the corner is turned and that some plant expansion will accompany an otherwise healthy and growing industry.

## Making Better Use of Technical Information

IN A LARGE industrial organization there is often a lack of co-ordination among the various departments. This is especially true when the engineering division is separate from the chemical and development division. Under these conditions there is apt to be poor contact between the two groups of men. The result is that much of the information and experience acquired by one group is not readily accessible to the other group. As a consequence there is "lost motion," and in some cases serious mistakes are made that could have been avoided had there been a more efficient exchange of information.

In the du Pont company an important step is being taken to overcome this lack of co-ordination. The du Pont Chemical Engineering Society has been organized with the object of studying the basic principles of chemical engineering and their practical application. This is being done through the presentation and discussion of papers by the members of the society, at its semi-monthly meetings. Inasmuch as membership is limited to technical employees of the du Pont company and since the meetings are not reported publicly, these discussions are free and open. There is no hesitation about asking and answering questions concerning engineering and operating difficulties, or concerning chemical data that have not been published.

The subjects selected for discussion include the basic operations common to all chemical plants. These are treated in such a way as to show clearly the relationship between the underlying scientific principles and plant practice. Special emphasis is laid on the necessity for close co-operation between the research and development chemists and the designing engineers. Both groups are enabled to profit by the experience of the process supervisors and operating superintendents. The subjects already discussed include "filtration" and "cost estimates," and it is planned to cover such topics as plant layout, materials of construction, power supply and process arrangement.

Because of its greatly diversified interests, the du Pont organization is peculiarly well fitted to profit by such an arrangement. Many other of our industries are doing much the same thing, although on a somewhat lesser scale. Certainly the move is in the right direction, and if properly guided should help to make technology a more efficient tool in chemical engineering production.

## Insuring Returns on Investment In Technical Conventions

INDUSTRIAL executives in charge of technical men generally recognize the value of staff representation at technical conventions. Unfortunately some boards of directors, even after encouraging the employment of technologists, are not prepared to pass a budget for traveling and other expenses incidental to attending meetings held from time to time throughout the country. The business acumen of these directors demands evidence that an investment in conventions shall show a profit. Defence of a large outlay, under such circumstances, becomes difficult unless figures can be produced to justify the policy.

The method that one manager has used with conspicuous success carries one step further the generally accepted system of making written reports. This man is a firm believer in the convention idea and recognizes the profit that is likely to be found in meetings that vary widely in character. Although engaged primarily in manufacturing wholesale drugs, he plans to have his staff attend the entire range of meetings in the business, technical and scientific societies. He justifies the expense involved by having each man calculate definitely the probable value of any given trip to the company. Ideas capable of being worked into practice are reduced to a dollars and cents basis, for sale to the holders of the purse strings.

Accurate check is made on such computations and upon the savings in manufacturing costs that result. In the course of several years better than a 100 per cent profit has been shown on the gross investment in society attendance. Moreover, by carefully choosing

his representatives for various meetings this executive is enabled to round out the experience of individual staff members, thus developing intangible assets that cannot be assigned a fixed value.

Although his plan may smack of the tactics of a college professor in handling indifferent students, it works out so well in practice that its consideration is commended to those who have to deal with a similar situation. If such a plan were generally adopted, an increasing number of men naturally qualified to attend would be present at society meetings in general—and the value of such meetings to industry would be decidedly enhanced.

## Publicity and the Establishment Of Professional Reputation

THE inarticulate scientist is as interesting as a dumb waiter. His "faith" need be followed by "work," which must be "known before men." This implies the release and, usually, the publication of results.

In a recent issue of *Science*, A. E. Verrill, the distinguished zoologist, narrates some interesting reminiscences in reference to the circumstances surrounding the publication of Willard Gibbs' famous memoirs in the *Transactions* of the Connecticut Academy of Sciences, at that time unconnected with Yale University. The publication committee had no funds in hand for the purpose, and the printing of the memoirs therefore involved personal self-sacrifice. Most of the members of the committee, including two able mathematical professors, agreed that Gibbs' researches and findings were incomprehensible to them; but the author's prestige was so great, and his reputation as a scientist was so firmly established, that no shadow of doubt seems to have arisen as to the desirability of publishing the papers. "We knew Gibbs and took his contributions 'on faith,'" says Mr. Verrill.

To become "known," two avenues are open—personal contact, and the publication of original thought or the results of research. The former is the less effective of the two. Moreover, it offers but little to the average worker unconnected with a large educational institution and as retiring in disposition as is the average scientist. Space in the columns of scientific and technical journals and in the transactions of the various professional societies is available to all earnest students; although difficulty may be experienced in the publication of researches on a few subjects, for economic reasons. Reputation in science and technology is determined largely by research, as measured by published result. To inculcate in the prospective technician a wholesome respect for the media of dignified publicity is even more important than training and encouragement in public speaking.

Published matter is the foundation on which professional reputation rests. A tedious apprenticeship may have to be faced by the novice; but science does not disdain the insignificant, so long as it is the truth. To hold back because of the apparent unimportance of the discovery or theory or interpretation is never justified. Many an edifice of knowledge is incomplete because a half brick is wanting, caused by the antipathy of the scientist to publicity in any form. This tendency must be overcome. The worker owes to himself the credit of initiative; he owes to those that have gone before, on whose work the foundation of present-day knowledge rests, a debt that can only be paid by frankness if not generosity toward his contemporaries. Whatever he publishes, be it worth while, will help to build his reputation. And when that is secure, his work, even though it be intelligible only to himself, like the Gibbs' memoirs, will be accepted "on faith," and published for the good of future generations.

## Constant Vigilance The Price of Industrial Safety

INDUSTRIAL executives who would do their part in reducing the 23,000 fatal accidents annually occurring in our factories and mines must adopt a policy of constant vigilance. In safety work, spasmodic efforts are of practically no use, as the natural impulse of the average worker is to return to the path of least resistance, to take a chance. Then, too, new machines, new processes and new employees are forever introducing into the plant new hazards. These hazards must not only be recognized; they should be analyzed with a view to finding the safest possible means of operation consistent with reasonable production cost. While it is true that mechanical safeguards often have a marked effect in reducing accident frequency, the training of the worker is still the most fertile field in accident prevention work. A mechanical equivalent of discretion is hard to supply, and once the executive has the mighty force of habit working for instead of against him, the conservation of human life and health will be much easier. But the formation of safe habits in a large group of industrial workers calls for high executive ideals to begin with, and for untiring energy ever afterward.

## How to Make A Good Drink

UNFORTUNATELY this does not refer to that kind of a drink but to soft drinks and to water. When does carbon dioxide have "pep"? Or, to put it in another way, when does a carbonated beverage have a sparkle and when does it taste flat? An interesting article in this week's issue gives us a clue to the answer. Impurities in the gas produce a flat taste. Such things as sulphur compounds, higher alcohols and doubtless many unidentified groups of materials will have this effect. Even in small quantities they seem to take the life and sparkle out of a beverage and the "pep" out of the gas.

There is an interesting parallel between carbonated beverages and water. In a large majority of municipalities (except where chlorine is used in excess or where piping is in bad condition) ordinary tap water tastes good. If that water is distilled, the resulting water has a peculiar flat taste. This is widely known and has become almost axiomatic.

About 10 years ago a group of scientific men, many of whom have since become famous, were discussing this problem. One of them pointed to some triple-distilled water, distilled once alone, once with potassium permanganate to oxidize organic impurities and once with dilute sulphuric acid to retain ammonia. "There," he remarked, "is pure water with high dielectric constant. It ought to taste good." He passed around the beakers and hospitably poured out the precious stuff. The vote was unanimous. It did taste

good. Further judicious tasting showed that tap water as well as tap water distilled once with alkaline permanganate tasted good and the only stuff that really tasted bad was the singly distilled tap water. Something obviously happened during that distillation that was removed by oxidation with alkaline permanganate. Impurities of an oxidizable character, then, cause that flat taste.

Doubtless a close analogy exists between the sparkle of pure water and the "pep" of good carbon dioxide. It doesn't take much impurity in either case to make them unpalatable and dispirited. And the answer may perhaps be that it takes a chemical engineer to make a good drink.

## Another Step Toward Domestic Potash Production

IN THIS issue we publish a preliminary article from the Bureau of Standards on recovery of potash salts from the waste waters of the Steffen process, which is used in the beet sugar industry. It is rather surprising to note that 12,000 tons of potash is annually thrown away in these waste waters. This is equivalent to 60 per cent of the present domestic production, and hence affords a very important source of byproduct potash if profitable development can be assured.

For the immediate present there is no prospect of replacing the 90 per cent of our potash consumption that comes from abroad by material from domestic sources. But every step toward such replacement contributes just that much to the lowering and stabilization of potash prices. It is particularly important that the byproduct sources of this sort be developed to the fullest possible extent, since they give the greatest promise of commercial success in the near future. Until we can explore some of the potash salt deposits that underlie Texas and perhaps other parts of the country, independent development of this mineral cannot be expected; and we must, until such developments occur, depend largely upon German and Alsatian supplies for the American fertilizer industry.

## A Lesson In Co-operation

RECENTLY an executive in one of the textile industries taught his dyer and his research man a lesson that neither is likely soon to forget, and he brought home to these two essential departments of his business most forcefully the importance of active co-operation between the scientific investigator and the "practical" plant man.

The lesson to the chief dyer was taught by the rather orthodox method of giving the chemist a real chance to try out his ideas of changing the process of dye bath control. Further interest in chemistry was aroused among the operating staff by means of short courses in elementary chemistry under the direction of the chief chemist. If that had been the only executive accomplishment, it would not have deserved special comment. But the lesson to the research man was taught in a somewhat novel fashion.

The executive called in the head of the laboratory and explained to him that the dyeing of small lots of certain high-priced textiles was costing too much in the plant. He asked the laboratory to take over this work under a rule that any lot less than 2 lb. should not be handled in the plant but should be transferred to the laboratory instead. The chemist thought that this was a splendid thing; but his delight with the arrangement lasted only long enough to undertake the dyeing of the first few samples. Within a few days he was out in the plant most humbly seeking the assistance of the practical dyer. He had learned that there was much more to the plant problem than simply mixing solutions to a given formula and passing the fabrics through the solution.

As a consequence of these two lessons this particular plant is making splendid progress. The laboratory no longer questions the value of certain empirical operations, but is perfectly willing to accept them until it can offer proof of better ways. And the dyers, in exchange, are giving every possible opportunity for improvement in the practical procedures and are welcoming the laboratory's aid. It takes no great imagination to foresee large success for this particular plant. It might be well for other executives to try out this system.

## Imaginary Advantages Of a "Natural" Product

THE Chilean Nitrate Producers Association is credited with a plan of advertising its product in competition with synthetic nitrogen compounds on the basis that a natural product is superior to one made artificially. Apparently the association plans to base its literature upon some rather extravagant claims as to the advantages of traces of iodine in the nitrates which are credited with most marvelous powers of stimulating plant growth. There is certainly nothing in the fertilizer research literature to show that nitrates containing iodine should have any preference in fertilizer production over the synthetic product. There are, of course, claimed advantages from tests of certain iodine compounds along with a thousand other claims for chemicals which have been used in an academic way for pot tests of plants; but this means nothing to the farmer who wishes to grow more cotton or tobacco per acre by the use of high-grade fertilizer.

The present occasion offers but one more example of the need of the American fertilizer industry for an adequate educational system. This need is going to be even more pressing in the field of synthetic ammonia and byproduct ammonium sulphate in the future than it has been in the past. At the present time we are able to market our surplus of ammonia in the form of sulphate only because the export market absorbs the excess above domestic requirements at a fair price. Within the next 10 years we can expect at least 50 and probably 100 per cent increase in ammonia production in the United States from coal alone. The export market undoubtedly will grow and if our export system is successful we shall get a fair share of the new foreign business, even in competition with Great Britain and Germany. But the domestic market must be stimulated also. We need not only an educational campaign for greater use of nitrogen fertilizer and a wider use of high-analysis goods but also a concerted effort backed by real facts from experimental study of soils and soil fertilization for the greater use of ammonium sulphate or other ammonia fertilizer. American producers can no longer afford to sit by while the Chilean producers of nitrogen spend all the money for education and propaganda.

# Putting "Pep" in Carbon Dioxide

## How the Soft Drink Manufacturer Cried for and Got Lively Gas by Means of the Reich Process

THE manufacturer of aërated or mineral waters wanted a special kind of carbon dioxide. It must be free from air, odor, taste; of high purity, and it must possess "pep." Many attempts have been made to produce a carbonic gas possessing these properties, but with little success from the commercial standpoint. Experiments usually resulted in the production of a good gas, but one not entirely satisfactory. The gas had a stale odor, or it lacked "pep."

What is "pep"? According to bottlers, it is an important characteristic of a gas that gives a lasting effervescence to the beverage, and quenches thirst by producing a generous flow of saliva. From the scientific standpoint the answer is hardly adequate. By research it was found possible to improve the quality of the gas until it possessed this property, but a complete explanation of the phenomenon is lacking. It is obvious that the methods of preparation and purification are the controlling factors.

Until the last few years carbon dioxide was produced in chemically pure form only from natural wells, or by the utilization of coal, coke, limestone or magnesite.

In a gas obtained from limestone and coke the impurities are chiefly sulphur compounds; in a gas obtained from fermentation they are higher alcohols and esters, in quantity dependent on the raw material used, the temperature and the time of collection of the gas during the fermentation process. Whether high or low temperatures are used, whether complete or incomplete oxidation takes place—these are important factors in the process of purification, as well as in the removal of impurities. Excepting that obtained from natural wells or magnesite, the product contained about 80 per cent air, and an absorption system was necessary. In such a system a solution of potassium or sodium carbonate is circulated through an iron tower, sometimes 100 ft. high, in which the carbon dioxide is absorbed and the carbonate converted into the bicarbonate. The solution then passes through heat exchangers into lye boilers, where the bicarbonate is decomposed into carbonate and the carbon dioxide again liberated. The cooled lye is returned to the absorption tower and the gas is dried and compressed. A recovery of 90 per cent is obtained, yielding a clean and odorless product of high purity.

The increasing demand for carbonated beverages gave impetus to the utilization of carbonic gas evolved during the fermentation of saccharine materials, a development that may revolutionize the industry, much as did the electrolytic-chlorine process in another field. The carbonic gas obtained in breweries is not suitable for aërated or mineral waters, because of the odor it frequently possesses.

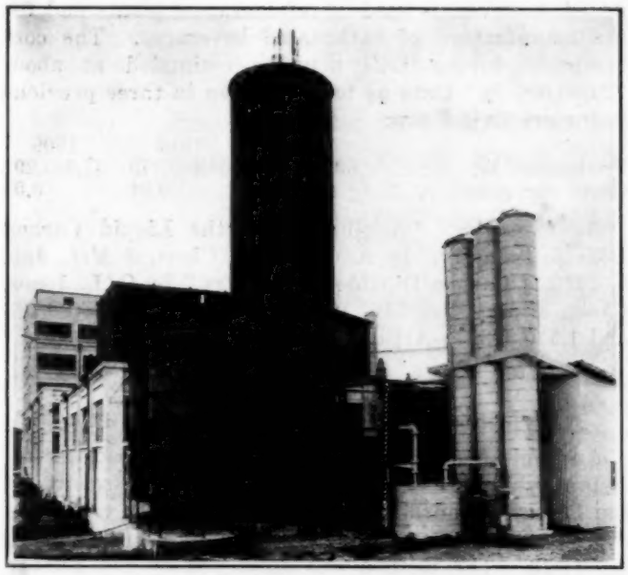
Fermentation gas is almost 100 per cent pure. If during purification it is heated to a high temperature or purified in a dry state, it seems to lose its "pep." Research shows that the less complete the oxidation of impurities the less the "pep," and vice versa. The presence of air in carbonic gas used to carbonate a beverage has an important influence on result.

A process (U. S. Pat. 1,519,932) for the purification of the carbon dioxide from fermentation, for the production of an odorless and tasteless gas that retains its "pep" even after storage for a long period of time, is in successful operation at the plants of the Mason Byproducts and Crystal Chemical companies, at Sausalito and Anaheim, Calif., respectively. The fermenting vats are glass lined, manufactured by the Pfaudler Co., Rochester, N. Y. They are provided with tight covers, for the purpose of saving the fermentation gas and to prevent its admixture with air. The cover is provided with a gas conduit, which leads to a catch-all—a closed receptacle provided with an overflow so arranged that a constant level of liquid, about 24 in., is maintained. The catch-all serves primarily to maintain a uniform back pressure on the fermentation vat, to prevent the entrance of air and to separate the entrained mash from the gas. The liquid in the catch-all is a dilute solution of alcohol coming from the scrubbers; it also serves to abstract from the gas part of the higher alcohols and esters.

After passing through the catch-all, the gas is led into three wooden scrubbers, with spiral filling rings, manufactured by the Mifflin Co., Atlanta, Ga., and provided with centrifugal pumps for the circulation of the liquid. In the first tower the gas is washed with a dilute aqueous solution of ethyl alcohol, which removes the bulk of the higher alcohols, esters and ethers—the primary cause of the objectionable odor. The solution is continuously withdrawn into the catch-all, where the gas is subjected to a preliminary washing.

In the second and third towers the gas is washed with water, for the removal of alcohol, and then delivered to the gasometer, which is continuously supplied with fresh water to prevent the accumulation of impurities. The wash water for the second and third towers is supplied from the overflow of the gasometer, a certain quantity of which is continuously withdrawn into the catch-all. An average of 1 gal. water is

With the enactment of the Eighteenth Amendment it was thought by many that the alcohol industry would cease to exist. Factories manufacturing alcohol for beverage purposes were shut down; but those making alcohol for industrial purposes are in better condition today than they were before prohibition. Keen competition and the increased demand for carbonated beverages focused the attention of distillers on one of their waste products, carbonic acid gas. A distillery manufacturing 10,000 gal. alcohol daily produces 66,000 lb. carbonic acid gas, or nearly 20,000,000 lb. per annum.



**A Striking Example of Progress in Chemical Engineering**

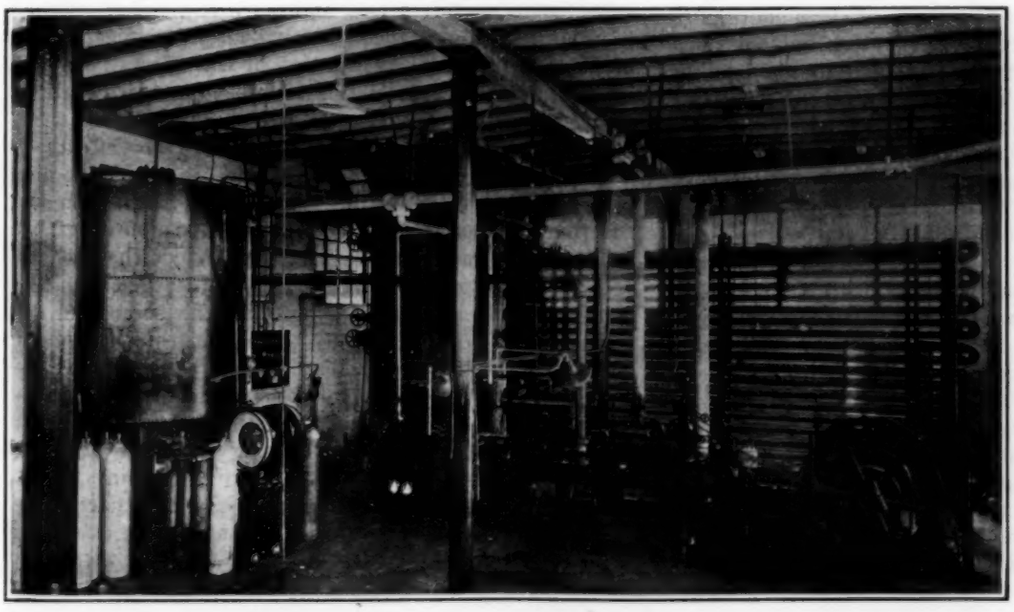
To the right of the picture is the scrubbing plant of the Reich process, where alcohol and part of the odorous products are removed prior to deodorizing and drying. This unit replaced part of the abandoned absorption-system plant to the left of the gasometer, which consisted of scrubbers, 9x50-ft. absorption tower and cooling coils, on the roof.

required per pound of carbonic gas; a plant producing 6 tons of gas per 24 hours requires 12,000 gal. scrubbing water. The scrubbing solution, containing alcohol, is returned to the alcohol plant, where it is distilled or used in the fermenters. During fermentation the loss of alcohol may amount to 1 per cent, which is recovered in the scrubbers. A plant producing 10,000 gal. alcohol daily can recover at least an additional 50 gal., which is more than sufficient to pay for the operation of the gas plant.

The gas is delivered under its own pressure to the gasometer and is almost free from alcohol and empyreumatic substances; but it still contains moisture, ammonia, sulphur compounds (depending on the raw material fermented) and the odor of fermented mash. From the gasometer it is forced with a blower into the oxidizing tank, which contains a solution of potassium bichromate. The gas entering the tank is discharged into the solution and then passes through a gas conduit into the bottom of a cast-iron sulphuric acid washing tower, in which the acid is circulated by means of a 2-in. Duriron pump, the valves for which were supplied by the Pacific Foundry Co., of San Francisco. The successive treatment of the gas with the chromate solution and the sulphuric acid serves completely to oxidize the remaining traces of organic impurities.

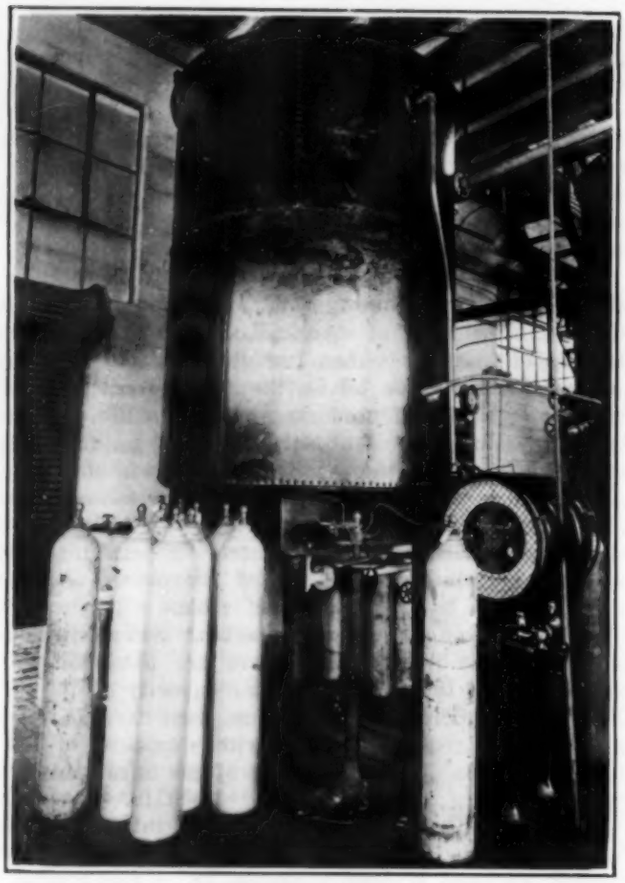
From the acid tower the gas passes into the bottom of a dry tower containing soda ash, for the removal of the small amount of entrained sulphuric acid. The dried, acid-free gas is then brought into contact with the usual compressor oil in the last tower, for the removal of oxidation products from the action of the chromate solution and the sulphuric acid on the gas, and is delivered to the compressor under a pressure of 2 to 3 lb.—perfectly dry, odorless, tasteless, of high purity and possessing the requisite "pep." The process, being carried on at atmospheric temperature and low pressure, involves the use of inexpensive equipment and loss by leakage is negligible.

At the Mason Byproducts plant at Sausalito two Norwalk motor-driven compressors are used for the compression of the gas, each with a capacity of 500 lb. $CO_2$ per hour. The Crystal Chemical plant has a Worthington steam-driven compressor with a capacity of 400 lb. $CO_2$ per hour. The compression of gas is carried out in three stages: at 80, 400 and 1,000 lb. pressure, respectively. The liquefied gas is filled into cylinders furnished by the Harrisburg Pipe & Bending Co., Harrisburg, Pa., and William Wharton, Jr., & Co., Easton, Pa. Each is subjected to a hydrostatic test of not less than 3,000 lb. per sq.in., and must comply with Interstate Commerce Commission regulations. The valves are provided with safety disks of frangible copper, 34 gage, B. & S. The cylinders are filled as they stand on a Toledo No-Spring scale. A tag attached to each shows the gross, tare and net weights. The gas is supplied to the trade in two sizes of cylinders, containing 20 and 50 lb., respectively. A normal analysis of the gas purified by this process is as follows: Carbonic acid, 99.8 to 99.9 per cent; moisture, slight trace; sulphur trioxide, none; organic matter, none.



**Cylinder - Filling Stand and Worthington Compressor**

In the background may be seen the discarded units of the absorption plant formerly in use, consisting of heat exchangers, lye boiler, dephlegmator and circulating pumps.



**Liquid Carbonic Gas Condenser**
From this condenser the cylinders, tested to a bursting pressure of 3,000 lb. per sq.in., are filled until the scale indicates a net content of 20 or 50 lb. of gas.

The U. S. Navy specification for gas to be used for refrigerating purposes is as follows: Carbonic acid, 99.5 per cent; moisture, 0.1 per cent.

The steaming of the cylinders is an innovation that has proved worth while. In carbonic gas plants it is usual to drain the returned cylinders and refill them, in spite of the fact that the gas has a strong affinity for flavors and odors. When a cylinder is returned, it is frequently found to contain from 5 to 20 lb. of carbonated water or other beverage. The trade is beginning to realize the importance of clean containers.

A plant of the kind described requires but one operator and one helper, who also attends to the loading, unloading, steaming and draining of the cylinders. An absorption plant of the same size requires from four to six men to operate it, and an additional capital investment of at least 50 per cent, exclusive of cylinders. Power consumption and cooling water requirements in an absorption plant are also approximately 50 per cent higher.

Carbonic acid is one of the most useful inert gases, particularly suitable as a fire extinguisher. It is used extensively in the ice cream and butter industries. Butter contains 10 per cent air; ice cream, 50 per cent. The substitution of carbonic gas for air is the feature of the so-called Heathized process. The gas is also used in the manufacture of salicylic acid, as an autoxidant in the rubber industry, for the extraction of logwood, for the fumigation of raisins with carbon bisulphide in order to avoid danger of explosion, and for paint-spraying purposes. Most of the gas produced, however, is used in refrigerating plants and for the manufacture of carbonated beverages. The consumption during 1924 may be estimated at about 72,000,000 lb. Data as to production in three previous years are as follows:

| | 1919 | 1914 | 1909 |
|---|---|---|---|
| Production, lb. | 59,771,411 | 50,445,779 | 47,953,291 |
| Cents per pound | 0.71 | 0.04 | 0.05 |

*Bibliography*: "A Glimpse of the Liquid Carbon Dioxide Industry," by A. G. Wikoff, *Chem. & Met.*, Jan. 3, 1923. "Carbon Dioxide in Industry," by C. L. Jones, *Chem. & Met.*, July 16, 1923. U. S. Patents 1,493,183 and 1,510,373, to Arthur A. Backhaus.

## Oxylene Timber Fireproofing Process

An impregnation process for rendering wood fire resistant, that has been given a satisfactory report by the British Admiralty on the basis of tests extending over 5 years, is described in *Engineering*, Jan. 2, 1925, pp. 11-13. The method was developed by the Timber Fireproofing Co., Ltd., Market Bosworth, near Nuneaton, England.

Wood is first steamed under high pressure in steel cylinders in order to open the pores of the wood and vaporize sap water. A vacuum is then created in the cylinders by shutting off the steam and connecting the cylinders with a condenser and vacuum pump. While still under vacuum, a solution of ammonium phosphate and other fireproofing chemicals is run in until the cylinders are full. Impregnation is then accomplished by hydraulic pressure. The impregnated wood is stacked in kilns using light laths to prevent contact and is dried so that the solution crystallizes in the wood fibers.

The theory of the action that ensues when heat is applied to the treated timber is very simple. Heat causes the expansion of the crystals on the outside of the wood. These form a glassy coating on the surface, which excludes oxygen and thus retards combustion.

## New Process for Carbon Black Production

From experiments now in progress at the Pittsburgh, Pa., station of the United States Bureau of Mines, it is expected to perfect a new and more economical method of manufacturing carbon black by an electrical treatment of oils. The investigation of the effects produced by the discharge of electrical energy on hydrocarbons showed that under certain conditions natural gas can be decomposed and carbon black produced. The effects on natural gas, liquid hydrocarbons and other oils are now being studied to learn the fundamental factors in the reaction. Under the electrical process, a number of by-products will result that will tend to reduce the net cost of production to a low figure. In connection with the investigations, it is pointed out that the successful development will go materially to expand this branch of industry, which has been handicapped on account of the decreasing supply of natural gas and the strong legislation against carbon black plants. This has brought about the maintenance of a high price for the product, which is essential in the manufacture of paints, inks, rubber products and other specialties. The experiments at Pittsburgh are being carried out under the direction of J. J. Jakosky.

# A Lesson in Waste Recovery

## Research Now in Progress at Bureau of Standards Indicates Possible Recovery of Potash From Steffen Beet Sugar Plant Waste Water

**By Walter J. Geldard and William D. Chase**
Bureau of Standards

IN THE manufacture of beet sugar, a residual liquor known as beet molasses is produced. This contains about 15 per cent of sugar that is recoverable only by the formation of a saccharate, as for example, in the Steffen lime process. In modern factories most of the beet molasses is thus desugarized, giving a dilute filtrate known as Steffen waste water. This contains about 3 per cent solids, consisting largely of nitrogenous organic compounds and potassium and sodium salts. The potash in particular offers possibilities for profitable recovery. Molasses discard, another waste from the Steffen process, results from the accumulation of non-sugar impurities during the recirculation of the liquor. It contains no recoverable sugar and is used largely for cattle feed.

By means of a questionnaire, statistics have been compiled from two-thirds of the operating plants in the country. In the companies operating these plants, the Steffen process is in general application, either at each factory or at one or more factories centrally located with respect to others of the same company. The results of this statistical survey are shown in Table I, in which the production of beet molasses and of Steffen wastes is summarized for a 5-year period. A few companies used various potash recovery processes during the war, but there are no extensive operations at the present time. The discard molasses is sold chiefly for cattle feed and a small proportion of waste water is evaporated to recover "potash char" for fertilizer.

From the figures in Table I, the total annual production of Steffen waste water may be estimated at 2,500,000 tons. This represents a potential supply of potash and nitrogen compounds available only through economical recovery processes. That such recovery is desirable is indicated by the increasing use of concentrated fertilizers and the fact that this country at the present time produces only about one-tenth of the potash that it consumes annually.

Assuming that Steffen waste water contains 3 per cent solids having an average potash content of 16 per cent (it varies in different localities between 12 and 20 per cent), the available potash supply from this source is 12,000 tons per year. The relation of this source to our production, imports and consumption of potash is shown in Fig. 1, which was based on statistics furnished through the courtesy of J. W. Turrentine of the Bureau of Soils.

Preliminary experiments at the Bureau of Standards indicates a possible yield of 227 lb. of crude salt, or 199 lb. of recrystallized salt, from each ton of concentrated waste water produced. These experiments were carried out on a sample of Steffen waste water that contained 46 per cent of solids. Since the usual solid content of this waste as it is produced in the factory is from 2 to 4 per cent, any profit derived from the production of potash salt must take into account the cost of concentrating this dilute liquor to a final composition of about 68 per cent solids. In fact, the margin of possible profit is so narrow that the production of potash salt is only one step in a complete scheme to utilize Steffen waste water. Investigations toward this end are now in operation and recent developments point hopefully to the possibility of a complete process that will yield not one, but a variety of commercially valuable by-products.

> This paper is the second of a series on the possibilities of recovering the valuable non-sugars in Steffen waste water from beet sugar refineries. The authors have given a splendid presentation of the economic and technologic aspects of a research problem that has for its goal the annual recovery of 12,000 tons of potash.

Two general methods of treating Steffen waste water have been patented. In the first, the recovery of valuable compounds is effected by chemical treatment, and in the second, products are derived by the destructive distillation of the waste. And in order to apply either of these methods the liquor must first be concentrated. This has been done in multiple effect sugar evaporators until the inorganic salts begin to separate. The saturation point is approximately 55 deg. Brix, or a specific gravity of 1.26 at 28 deg. C. A typical sample of Steffen water for this investigation was obtained from the Great Western Sugar Co. It was carbonated to remove excess lime and concentrated to 55 deg. Brix, or a specific gravity of 1.258 at 28 deg. C. The dry solids content was 46.1 per cent.

The first evaporations were for the purpose of preparing betaine and glutaminic acids. According to the patent, this preparation requires a liquor of 1.40 specific gravity, but before this concentration was reached a considerable quantity of inorganic salts separated. The recovery, yield and composition of these salts furnish the subject of the remainder of this paper.

To prevent decomposition of organic matter, a waste water evaporation was made in a partial vacuum. The experimental evaporator shown in Fig. 2 was patterned after an ordinary commercial evaporator having a salt

**Table I—Statistics of Domestic Beet Molasses, Steffen Discard Molasses and Steffen Waste Water**

| | 1917–18 | 1918–19 | 1919–20 | 1920–21 | 1921–22 |
|---|---|---|---|---|---|
| Beet molasses produced, tons | 205,600 | 237,300 | 256,600 | 333,500 | 309,200 |
| Sugar, per cent | 52.0 | ..... | ..... | ..... | 54.0 |
| Ash, per cent | 13.0 | ..... | ..... | ..... | 12.5 |
| Molasses treated by Steffen process, tons | 141,000 | 175,200 | 211,100 | 248,900 | 246,900 |
| Steffen discard molasses, tons | 54,600 | 52,700 | 59,700 | 94,100 | 73,700 |
| Gravity, deg. Brix | 83 | ..... | ..... | ..... | 85 |
| Sugar, per cent | 52 | ..... | ..... | ..... | 54 |
| Steffen waste water, tons | 1,296,500 | 1,648,700 | 1,864,800 | 2,146,500 | 2,178,700 |
| Gravity, deg. Brix | 4.2 | 4.4 | 4.0 | 4.2 | 4.4 |
| Sugar, per cent | 0.42 | 0.48 | 0.36 | 0.35 | 0.35 |

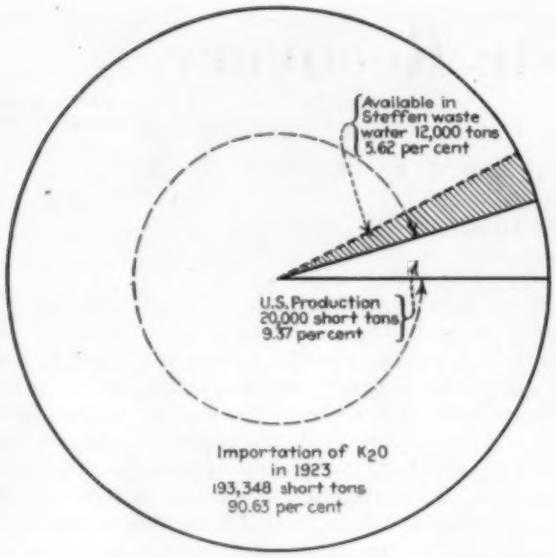



**Fig. 1—Graphic Analysis of Potash Consumption**
The pie-diagram shows the amazing extent of our reliance on foreign sources for the potash essential to American chemical industry.

catch. The progress of the evaporation toward the specific gravity desired was indicated by the volume of condensed water.

From several preliminary evaporations, a considerable quantity of inorganic salts was selected. These salts were mixed and a portion recrystallized from water. A qualitative test on the purified salt indicated the presence of potassium, chloride, nitrate and sulphate, and the absence of calcium, sodium and phosphate. The quantitative analysis follows:

| | Per Cent | | Per Cent |
|---|---|---|---|
| Potassium | 49.89 | Sulphate | 3.90 |
| Chloride | 36.31 | | |
| Nitrate | 9.80 | Total | 99.90 |

The results of this analysis presented new and interesting possibilities in waste water evaporation. Potash is not only a desirable and valuable byproduct, but its desirability and value should be increased if it could be produced pure and on a large scale as indicated by this

**Table II—Summary of Continuous Evaporation Test**

| | Run No. 5 | Run No. 6 | Run No. 8 | Final Wash | Totals or Averages |
|---|---|---|---|---|---|
| Volume waste water, c.c. | 5,000 | 5,000 | 5,000 | ... | 15,000 |
| Sp. gr. waste water at 28 deg. C. | 1.257 | 1.257 | 1.257 | ... | 1.257 |
| Mean evap. pressure, mm. | 14.6 | 18.5 | 12.7 | ... | 15.3 |
| Mean temp. boiling liquor, deg. C. | 29.5 | 31.8 | 29.1 | ... | 30.1 |
| Vol. conc. waste water, c.c. | 2,670 | 2,540 | 2,630 | 210 | $8,05_0$ |
| Sp. gr. conc. waste water at 28 deg. C. | 1.369 | 1.377 | 1.373 | ... | $1.37_3$ |
| Weight crude salts, grams | 350 | 435 | 418 | 55 | $1,25_8$ |
| Weight recrystallized salts, grams | ... | ... | ... | ... | $1,10_1$ |

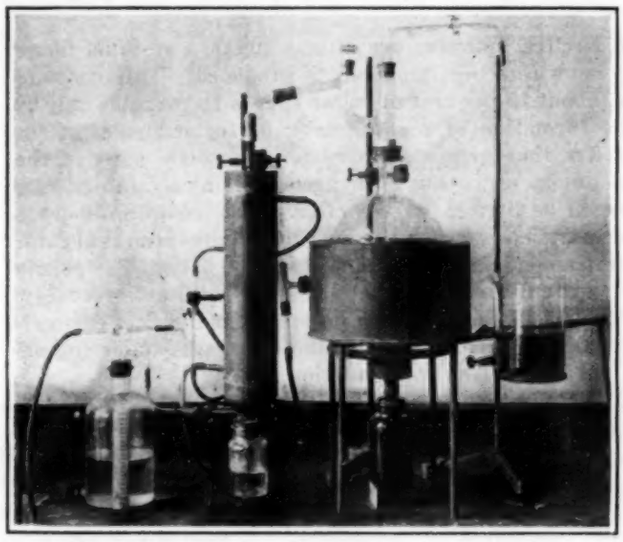


**Fig. 2—Apparatus for Waste-Water Evaporations**
A laboratory scale apparatus designed after the manner of full-sized commercial salt recovery evaporators. The salts are fractionated simultaneously with precipitation.

initial analysis. Growing plants show a selective action in the absorption of potassium from the soil, but the analysis of many samples of beet and beet molasses ash also indicates that considerable sodium is usually present with the potassium. The ratio of potassium to sodium is 3 or 4 to 1. A consideration of the solubility curves of the various inorganic salts present in waste water indicates that it might be possible to separate only potassium compounds during the concentration of the liquor, but beyond some points sodium compounds would necessarily appear. A series of carefully made labora-

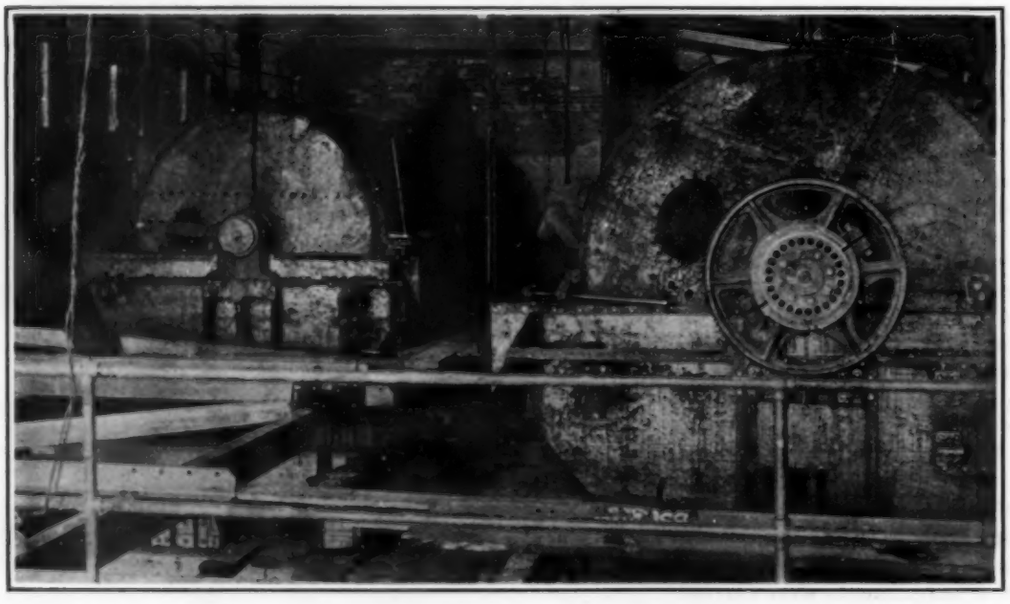


**Fig. 3—A Corner in a Beet Sugar Mill**
One of the Great Western Sugar Co.'s mills in which the Steffen process of sugar recovery is practiced successfully. A typical opportunity for potash recovery, too.

tory tests indicated that the precipitation of sodium compounds may be prevented if the specific gravity of the concentrated liquor is not more than 1.38 at 28 deg. C.

As the foregoing test proved inadequate for estimating yields in large-scale operation, a continuous series of tests was made in which 15 liters of waste water was concentrated in three equal batches, and all wash waters from the intermediate crystallization were returned to the process as would be done in actual plant operation. Table II summarizes this test. The analysis of the recrystallized salt follows:

| | Per Cent | | Per Cent |
|---|---|---|---|
| Potassium chloride | 66.90 | Volatile matter and moisture | 0.60 |
| " nitrate | 27.58 | | |
| " sulphate | 3.92 | Total | 99.00 |

On the basis of continuous test yield, each ton of concentrated waste water of specific gravity 1.37 will yield 227 lb. of crude potassium salt, or 199 lb. of recrystallized salt.

Attempts were made to separate by fractional crystallization one of the potassium salts indicated in the analysis given above—the chloride, for instance. A few preliminary tests indicated that there is no simple method of preparing a single pure salt from the mixture obtained. Furthermore, a system for this particular combination of salts would have slight value, as the composition of the salt obtained from this sample of waste water might be entirely different from that of a waste water obtained from another locality.

## Dry Kiln Short Course

Announcement has just been made of the sixth annual short course in dry kiln engineering at the New York State College of Forestry, Syracuse University. The course will be given March 16 to 26, inclusive, by the department of forest utilization under the direction of Prof. Hiram L. Henderson.

The demonstration of new steel-framed, asbestos-paneled, fireproof, heat, moisture and decay proof dry kiln doors will be a feature of this course. How to pile lumber properly for drying, moisture content, shrinkage and casehardening tests, will be demonstrated. How to relieve these defects will be shown, together with work in temperature and relative humidity problems. How to determine circulation, to operate kilns by automatic regulators, to locate kiln troubles, to keep kilns in repair, to prepare layouts for the most efficient handling of lumber and how to select type and size of kilns for particular drying problems will be taught in this short course of 10 days of intensive training.

Only a common school education is required for admission. This is an opportunity for shop foremen, production engineers, and others concerned in seasoning lumber to obtain first hand information on the subject. The only expense is a registration fee of $25 in addition to the incidental expenses of the trip, such as transportation and living costs. Room and board may be secured in Syracuse from $10 to $12 a week. The class will be limited to twenty-five. Applications will be accepted in the order they are received.

# Steam Table for Low Pressures

### Latent Heat Expressed in Metric Units for Pressure of 90 to 1,100 Mm.

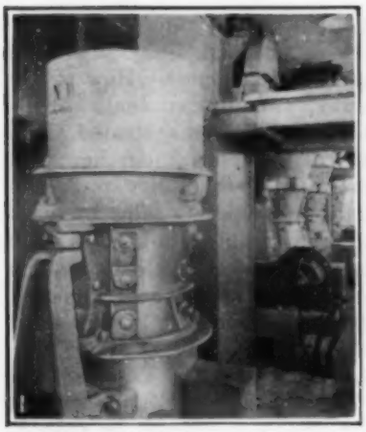
**By W. L. Badger**
Director, Evaporator Experiment Station, Ann Arbor Mich.

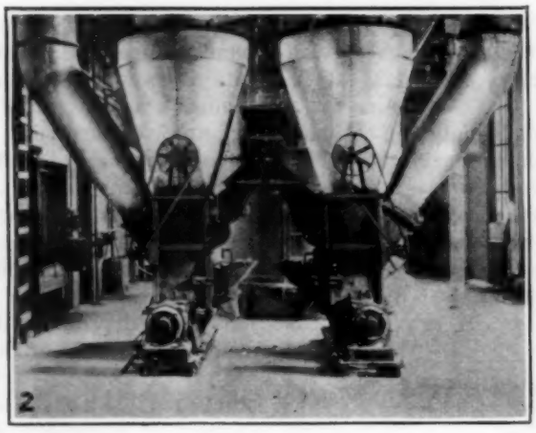
IN CONNECTION with the work in the evaporator laboratory, it was found that the calculation of steam temperatures from ordinary steam tables was slow and laborious. The following table covers the range from 90 to 1,100 mm. Hg, absolute pressure, corresponding to a temperature range from 49.5 to 110.7 deg. C. The latent heat in kilogram-calories is given under the corresponding temperature. Intermediate figures can of course be obtained by interpolation.

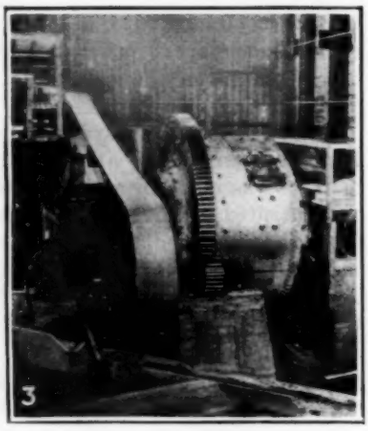
**Metric System Steam Tables***

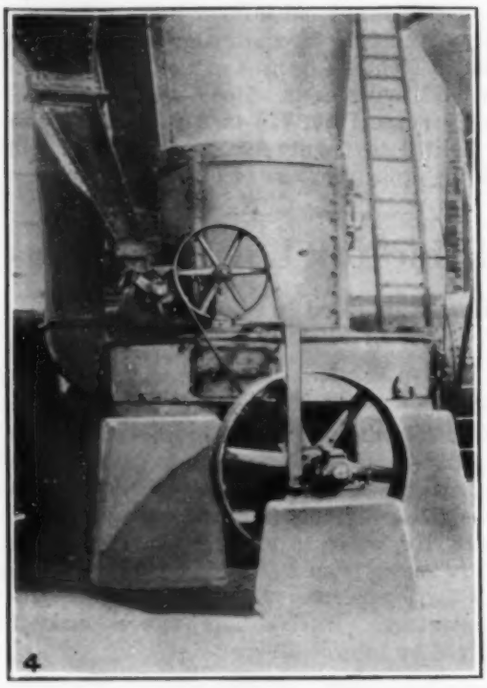
| Press. mm. Hg | Temp. Deg. C. Lat. Ht. Kg. Cal. | Press. mm. Hg | Temp. Deg. C. Lat. Ht. Kg.Cal. | Press. mm. Hg | Temp. Deg. C. Lat. Ht. Kg. Cal. | Press. mm. Hg | Temp. Deg. C. Lat. Ht. Kg. Cal. | Press. mm. Hg | Temp. Deg. C. Lat. Ht. Kg. Cal. | Press. mm. Hg | Temp. Deg. C. Lat. Ht. Kg. Cal. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 49.49<br>568.7 | 260 | 72.50<br>555.5 | 430 | 84.79<br>548.2 | 600 | 93.51<br>542.8 | 770 | 100.37<br>538.5 | 940 | 106.06<br>534.9 |
| 100 | 51.61<br>567.5 | 270 | 73.38<br>555.0 | 440 | 85.38<br>547.8 | 610 | 93.96<br>542.5 | 780 | 100.73<br>538.3 | 950 | 106.37<br>534.6 |
| 110 | 53.57<br>666.5 | 280 | 74.24<br>554.5 | 450 | 85.95<br>547.4 | 620 | 94.39<br>542.3 | 790 | 101.09<br>538.0 | 960 | 106.68<br>534.4 |
| 120 | 55.37<br>565.4 | 290 | 75.08<br>554.0 | 460 | 86.52<br>547.1 | 630 | 94.83<br>542.0 | 800 | 101.44<br>537.8 | 970 | 106.98<br>534.2 |
| 130 | 57.06<br>564.5 | 300 | 75.89<br>553.5 | 470 | 87.08<br>546.8 | 640 | 95.25<br>541.7 | 810 | 101.79<br>537.5 | 980 | 107.28<br>534.0 |
| 140 | 58.63<br>563.6 | 310 | 76.69<br>553.1 | 480 | 87.62<br>546.4 | 650 | 95.68<br>541.4 | 820 | 102.14<br>537.3 | 990 | 107.58<br>533.9 |
| 150 | 60.11<br>562.7 | 320 | 77.45<br>552.6 | 490 | 88.15<br>546.1 | 660 | 96.09<br>541.1 | 830 | 102.48<br>537.1 | 1000 | 107.87<br>533.7 |
| 160 | 61.51<br>561.9 | 330 | 78.20<br>552.2 | 500 | 88.68<br>545.8 | 670 | 96.50<br>540.9 | 840 | 102.83<br>536.9 | 1010 | 108.17<br>533.5 |
| 170 | 62.84<br>561.2 | 340 | 78.94<br>551.7 | 510 | 89.20<br>545.5 | 680 | 96.91<br>540.7 | 650 | 103.16<br>536.7 | 1020 | 108.46<br>533.3 |
| 180 | 64.10<br>560.4 | 350 | 79.64<br>551.3 | 520 | 89.71<br>545.1 | 690 | 97.31<br>540.4 | 860 | 103.50<br>536.5 | 1030 | 108.75<br>533.3 |
| 190 | 65.31<br>559.7 | 360 | 80.34<br>550.9 | 530 | 90.21<br>544.8 | 700 | 97.71<br>540.1 | 870 | 103.83<br>536.3 | 1040 | 109.0<br>532.9 |
| 200 | 66.46<br>559.1 | 370 | 81.02<br>550.5 | 540 | 90.70<br>544.5 | 710 | 98.11<br>539.8 | 880 | 104.16<br>536.1 | 1050 | 109.31<br>532.7 |
| 210 | 67.57<br>558.5 | 380 | 81.68<br>550.1 | 550 | 91.19<br>544.2 | 720 | 98.49<br>539.6 | 890 | 104.48<br>535.9 | 1060 | 109.5<br>532.5 |
| 220 | 68.63<br>557.8 | 390 | 82.33<br>549.7 | 560 | 91.66<br>543.9 | 730 | 98.87<br>539.4 | 900 | 104.80<br>535.7 | 1070 | 109.87<br>532.4 |
| 230 | 69.64<br>577.2 | 400 | 82.97<br>549.3 | 570 | 92.13<br>543.6 | 740 | 99.26<br>539.1 | 910 | 105.12<br>535.5 | 1080 | 110.15<br>532.2 |
| 240 | 70.63<br>556.6 | 410 | 83.59<br>548.9 | 580 | 92.60<br>543.3 | 750 | 99.63<br>538.9 | 920 | 105.44<br>535.3 | 1090 | 110.42<br>532.0 |
| 250 | 71.58<br>556.0 | 420 | 84.20<br>548.6 | 590 | 93.06<br>543.1 | 760 | 100.00<br>538.7 | 930 | 105.75<br>535.1 | 1100 | 110.70<br>531.8 |

*Calculated from the steam tables of the "Chemical Rubber Handbook."









# *Operating Installations of Pulverizing Equipment*

***Fig. 1—Rotary Crusher Handling Salt***

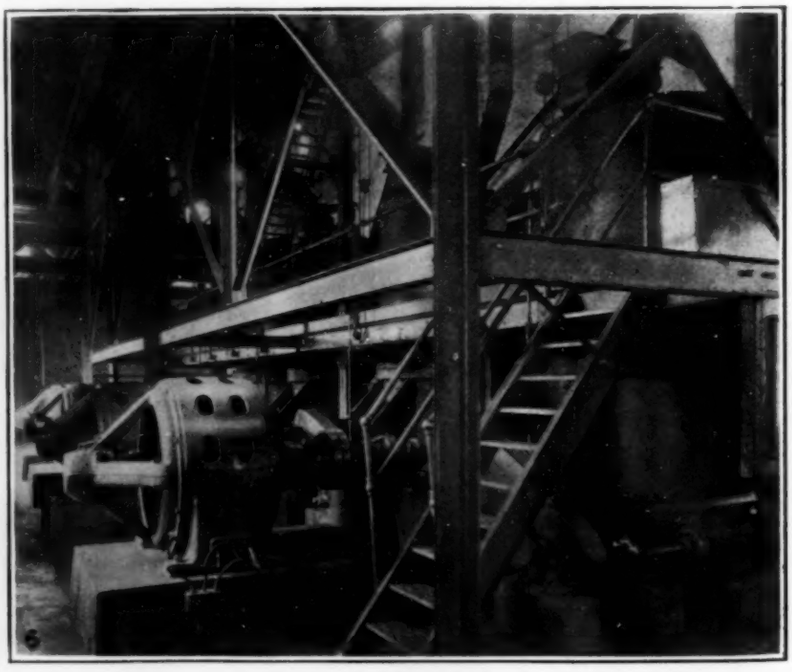
***Fig. 2—Beater Mill With Air Separator Pulverizing Hydrated Lime***

***Fig. 3—Ball Mill***

***Fig. 4—Roller Mill With Air Separator***

***Fig. 5—Hammer Mill***

***Fig. 6—Centrifugal Mill, Ball Type***



# Modern Pulverizing Methods

## Selection of the Proper Pulverizer for Chemical Materials Requires Accurate Knowledge of the Characteristics of Available Equipment and a Thorough Understanding of the Real Meaning of Fineness

**By S. B. Kanowitz**
Eastern Manager, Raymond Bros. Impact Pulverizer Co., New York

THE chemical manufacturer of the present day is continually running into pulverization problems which his predecessor did not encounter. The standard of fineness of reduction has gone up considerably and where quite recently a 100-mesh or 150-mesh product sufficed, now a 300- or a 350-mesh is not considered too fine.

Before proceeding to discuss the type of equipment most suitable for various materials we shall give a general description of pulverizing equipment in general use. Most of the grinding equipment used in the chemical industry may be divided into four general types: 1. Beater mills. 2. Roller mills. 3. Tube mills. 4. Stone mills.

*Beater Mills*—In the beater type of mill we may include hammer mills, ring mills and beater blade mills—the hammers or blades being fixed or swinging. The mill consists of a shaft carrying one or more spiders or rotors on which are mounted the beaters or hammers. The material is pulverized by the impact of the hammers, which have a tip speed in many cases as high as 20,000 linear feet per minute. The rotors are surrounded by a housing; the lower half of the housing is made up of perforated metal, grids or grate bars, through which the pulverized material is discharged. The spacing between these bars can be adjusted to regulate the fineness of the discharged product. Fig. 1 illustrates a typical hammer mill which indicates the beaters and the bars on the bottom through which the pulverized material is discharged.

Some machines, instead of having bars, have part of the housing surrounded by a screen or perforated metal. The material entering this machine is beaten up until fine enough to pass through the perforations. A cut of this type machine is shown in Fig. 2.

Hammer mills are used when a material is to be reduced to a moderate degree of fineness. When pulverizing a hard or crystalline product, the maximum efficiency is obtained when the hammer mill delivers a product testing about 50 per cent through a 100-mesh screen or about 30 per cent through a 200-mesh screen. When it is attempted to produce a finer product, the spacing between the bars is set so close that there is a tendency for the openings to clog up, choking the machine and also increasing the wear and tear on the beaters and housing. When softer materials are handled by this machine, such as clays, precipitates and filter-press products, a finer product can be obtained, testing as high as 85 to 90 per cent through a 200-mesh screen. For many purposes this is fine enough, as in certain soft pigments which are again ground in oil, any oversized particles that might exist will be ground up during this second grinding.

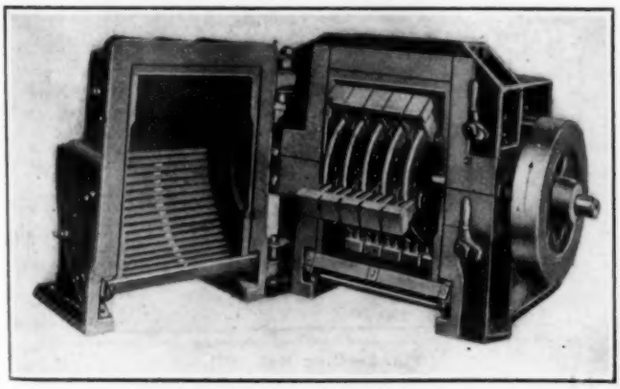


**Fig. 1—Hammer Mill**
Typical construction includes a series of swinging hammers mounted on a rotor and adjustably spaced grate bars through which the pulverized product is discharged.

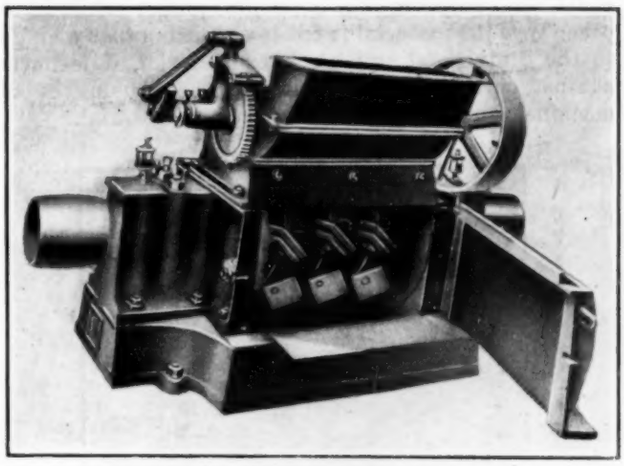


**Fig. 2—Hammer Mill**
In this type of hammer mill a screen or perforated metal is used instead of grate bars.

Before leaving this type of pulverizer we might mention the cage mill. The cage mill consists of two or more concentric cages, similar in construction to a squirrel cage mounted concentric on shafts and revolving in opposite directions. The material is fed to the inner cage and in dropping through the various cages is beaten up by the cage bars, which have an extremely high relative velocity.

There is a second type of beater mill in which air separation is used for regulating the fineness of the finished product instead of cage bars or screens. (See Fig. 3.) In this type the material is pulverized by impact. The air entering the rear of the machine elevates the pulverized material, which consists of fines and some coarse particles, to the inside of the separator mounted on the pulverizing chamber. In this separator the coarser particles are separated and drop back to the pulverizing chamber, while the fines enter the fan intake and are delivered to a cyclone collector, which in turn

discharges the fines to bins or bags; and the air is returned back to the pulverizer—thus completing the cycle. In some mills of the air-separating type no actual separator is used, the fan being mounted on the same shaft as the beaters, the material passing laterally through the pulverizer chamber, by the beaters and into the fan, which discharges the material in a manner indicated above. This type is usually known as the unit machine and is illustrated in Fig. 4.

The above descriptions outline in general most of the pulverizers on the market known as high-speed beater or hammer mills. There are a few variations of the above: In one case the rotors are mounted on a vertical shaft, thus rotating in a horizontal plane; while in the other type the material is fed to a rotating disk and, due to the centrifugal action on the material, it is hurled against corrugated liners around the housing of the machine, which tends to pulverize the material.

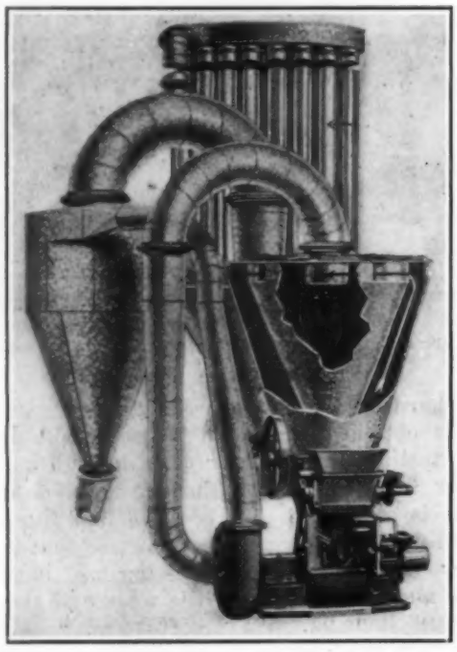


**Fig. 3—Beater Mill With Air Separator**
Material is pulverized by impact and air currents are used for regulating the fineness of the finished product.

*Roller Mills*—Pulverizers are usually designated as roller mills when a material is pulverized between rolls or balls and a grinding ring. This type of equipment may be divided into two classes: ring roll mills and centrifugal roll mills.

In the ring roll mills there is a vertical ring supported on three rolls which maintains a pressure against its face. This pressure may be increased or diminished by means of adjustable springs. The material is crushed between the rolls and the ring and discharged through the bottom of the mill. (Fig. 5.)

In the centrifugal roll mills the material is ground between a stationary grinding ring and rolls or balls which revolve and roll on the grinding ring. Due to the motion of rotation, a pressure is maintained between the rolls and the ring by the centrifugal force set up. In this class some of the machines have balls that rotate against a stationary horizontal ring. In another type the rolls are mounted on a shaft, which rotates in a journal. This journal is supported in trunnions on a spider fixed to a rotating vertical shaft. As this shaft rotates, due to the centrifugal force, a pressure is set up between the rolls and the ring which pulverizes the material. One modification of this type is where the grinding ring is in a vertical plane and the rolls are driven around by means of a driver mounted on a horizontal shaft. In the ring roll mill with spring adjustment, the material is completely ground after it passes the rolls and is discharged through the bottom of the machine. In another type the fineness is obtained in one case by discharging the material through a screen which is within the housing surrounding the grinding medium. For finer grinding, air separation is used in a manner similar to that described above for the impact beater mill, the air entering through port holes underneath the grinding ring and removing the fines as fast as they are generated. (Fig. 6.)

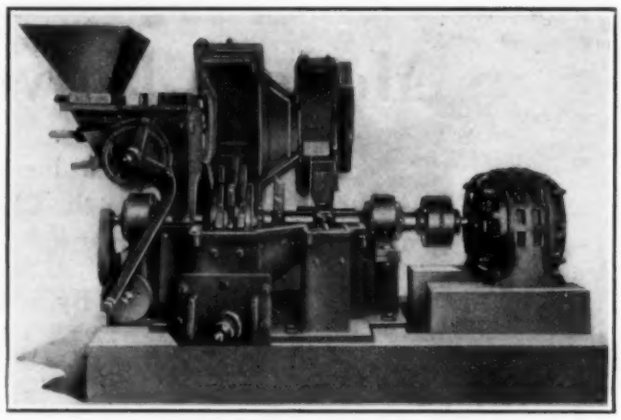


**Fig. 4—Unit Type Air-Separator Mill**
With this type no actual separator is used. The fan is mounted on the same shaft as the beaters and serves to draw out and discharge the fine product from the beater chamber.

Differential rolls may be mentioned here, as they are often designated as roller mills. They consist of one or more pairs of rolls revolving in opposite directions, the material being pulverized between the rolls. The variation in fineness is obtained by means of springs which can be adjusted to bring the rolls closer together.

*Tube Mills*—Under this heading we might classify all types of ball, pebble, rod and jar mills.

**Fig. 5—Ring Roll Mill**
As the ring revolves, material is pulverized between it and the three rolls, which have adjustable springs for regulating the pressure against the ring.

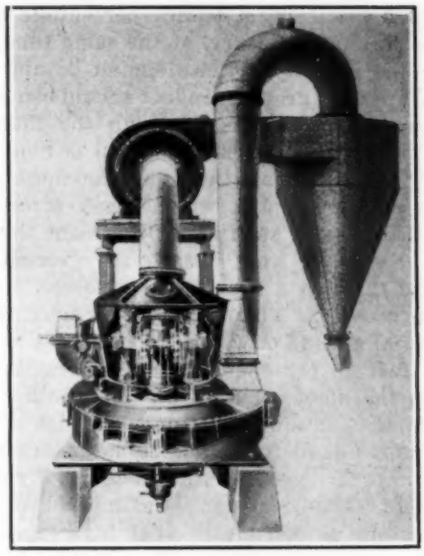


**Fig. 6—Centrifugal Roll Mill**
In this type the ring is horizontal and stationary. The rolls are suspended from a spider attached to a vertical shaft so that as the shaft rotates the rolls are pressed against the ring by centrifugal force.

A tube mill consists primarily of a hollow cylinder filled with a certain amount of steel balls, slugs or pebbles. They are operated in two ways—namely, batch and continuous. In batch tube mill a definite amount of material is fed to the mill along with the proper charge of balls or pebbles. It is then closed and rotated until the material is reduced to the proper fineness and then the material is discharged and a new batch added. In the continuous discharge tube mill the raw material continuously enters the mill at one end after passing through the tube mill is continuously discharged. The capacity and fineness will vary with the weight of the charge of balls or pebbles, and length of the mill; and in the batch type, on the time the material is ground before being discharged.

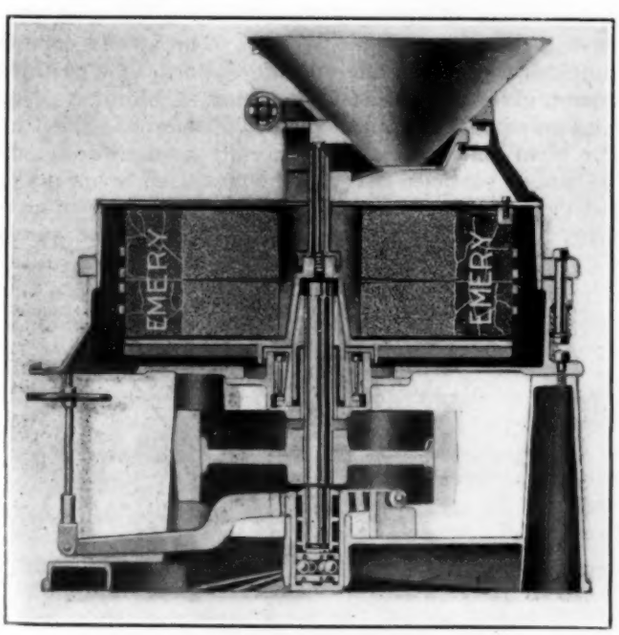



**Fig. 8—Buhrstone Mill**
Centrifugal force aided by grooves in the stones works the material from the central feed well to the discharge at the outer edge of the stones.

The tube mill is used mostly on materials that are very abrasive in character, such as various refractory ores, quartz, corundum and other siliceous materials, where the wear and tear on other types of mills would be too high. They are also used when it is necessary that the pulverized product is to be in porcelain, enamels, etc., and must be free from iron. Mills having the grinding parts made of iron or steel tend to introduce particles of metal in the finished product. The tube mill can be lined with a non-metallic lining, such as silex, and pebbles, flint or porcelain balls used as the grinding medium.

*Stone Mills*—Stone mills may be roughly divided into two general classes. In one type the grinding media are circular stones, which disintegrate the material as they revolve in a dished trough or pan. To this class belong the types known as dry pans, chasers and edge runners. The fineness of reduction is usually accomplished by varying the distance between the stones and the pan or,

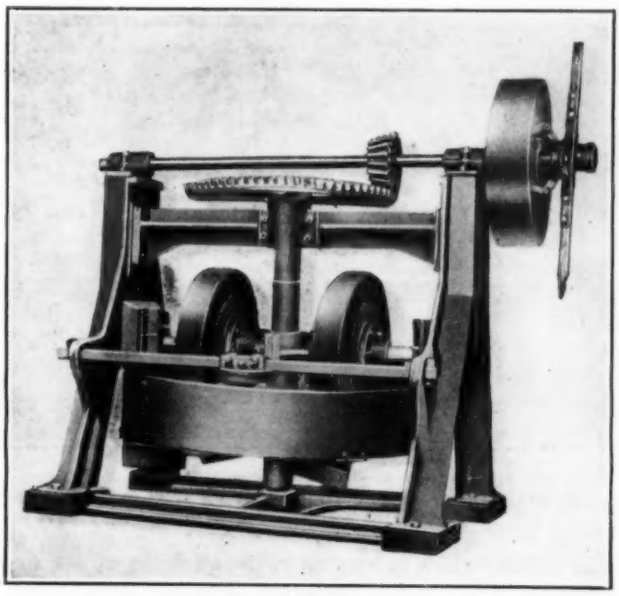


**Fig. 7—Dry Pan**
Although not adapted for fine pulverizing, the dry pan is used for producing finely crushed material, particularly where a mixing or blending action is desired.

as in the case of dry pans, by changing the size of the slots in the bottom of the pan. This type of mill is not adapted for fine pulverizing, but is used for producing a finely crushed material, and also in many cases where a mixing or blending action is required. (Fig. 7.)

The second class of stone mills is known as buhrstone or rock emery mill. This class may also be divided into two types—the horizontal and the vertical. In the horizontal machine (Fig. 8) there are two circular stones, one on top of the other, one rotating and the other stationary. The raw material is fed to the mill through a hole in the center of the top stone, dropping to the bottom stone, where it is reduced by the rubbing action between the two stones. While being ground the material is distributed over the surface of the stones by centrifugal force and aided by grooves cut more or less radially in the stones. The pulverized material is forced to the periphery and discharged in the housing surrounding the stones.

In the vertical mill (Fig. 9), the stones are in a vertical position and the revolving stone thus revolves in a vertical plane. A screw mounted on the drive shaft

feeds the material through one of the stones to the space between the stones, where it is ground and discharged in a manner similar to that of the horizontal machine. The fineness in both machines is varied by moving one of the stones nearer the other. Buhrstones have been used to a considerable extent for fine grinding of various non-metallics, paint pigments, etc. The capacity on this type is rather low, particularly when it is desirable to produce a fine product. It is the present practice, however, when an extremely fine product is required, to supplement the stone mills by bolting reels or an air separator. These adjuncts remove the fines and the tailings are returned to be reground. It is also claimed that in grinding certain pigments, buhrstones, due to the rubbing action, will blend the various ingredients in the raw material to a better advantage and produce a richer color.

*Fineness of Grinding*—In discussing the various types of mills, we mentioned that some mills will grind finer

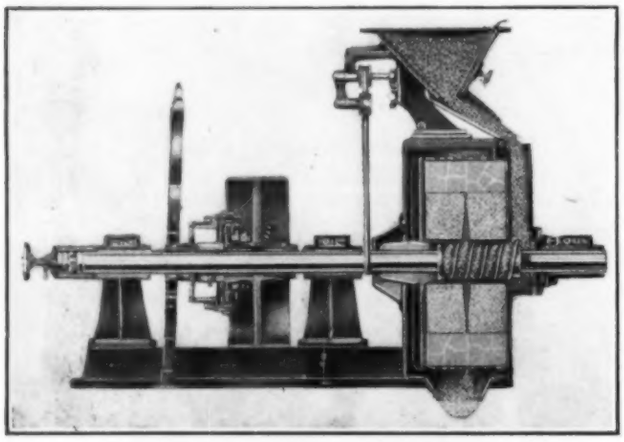


**Fig. 9—Vertical Stone Mill**
In this vertical type a screw mounted on the drive shaft feeds the material to the grinding surfaces.

than others, which brings us to the question of defining the term "fineness." The terms "fineness" and "mesh" are used in a very loose sense. Many users of pulverized materials will state that they require a 200-mesh product, without specifying a definite percentage through the 200-mesh screen. Upon investigation it is often found what they mean is that the bulk of the product should pass through the specified screen, say 80 to 85 per cent. Now there is all the difference in the world between the capacity obtained on a pulverizer when grinding some materials 80 per cent through a 200-mesh and 100 per cent through a 200-mesh screen.

The curves shown in Fig. 10 give a good idea as to the performance of a mill equipped with air separation when grinding a material like barytes to various finenesses. It will be noticed that the capacity of the particular grinding unit in question, when grinding to a fineness of 80 per cent through 200-mesh is nearly four times as great as when grinding the same material so that all the ground product passes the 200-mesh screen. This shows the importance of specifying exactly the fineness, for it will be found that the cost of pulverization rises very rapidly as the fineness is increased. It will be noticed when grinding 80 per cent through 200-mesh the power consumption per ton is about 15 hp., while when grinding the same material to 100 per cent through 200-mesh, the power consumption is more than 40 hp. per ton.

Even when specifying a definite percentage through a certain mesh, it is necessary, at the same time, to state what size the largest particles should be and also the amount of fines the ground product should contain—that is, the percentages passing through the finer screen. For example: If a pulverized material is required such that 95 per cent shall pass through a 100-mesh screen, it should be stated through which mesh screen all the material should pass, such as 100 per cent through 50-mesh; at the same time stating the percentage that should pass through a 100-, 200-, 300-mesh screen and finer, if necessary. This is of importance, since the same material ground on two different types of machine may both test 95 per cent through 100-mesh, but will vary as to the amount of impalpable powder that the material might contain and also on the size of the particles in the residue left on the 100-mesh screen.

The fineness of a ground product is usually measured by means of testing sieves. Testing sieves may be obtained as fine as 350 mesh—that is, a screen having 350 openings per linear inch. The term "mesh" has no definite significance unless the diameter of the wire from which the screen is made is known, since without this factor the size of the opening cannot be determined.

| Sieve No. | Dia. of Opening, In. | Sieve No. | Dia. of Opening, In. | Dia. of Opening, Microns |
|---|---|---|---|---|
| 20 | 0.0331 | 100 | 0.0059 | 148 |
| 25 | .0278 | 120 | .0049 | 122 |
| 30 | .0234 | 150 | .0041 | 100 |
| 35 | .0197 | 170 | .0035 | 88 |
| 40 | .0166 | 200 | .0029 | 73 |
| 45 | .0139 | 250 | .0024 | 60 |
| 50 | .0117 | 300 | .0018 | 45 |
| 60 | .0098 | 325 | .0017 | 43 |
| 80 | .0070 | 350 | .0016 | 40 |

The above table gives the sieve number and also the size of openings. The term "sieve number" is used by the manufacturer to designate the size of the screen. However, in a popular sense, the term "mesh" is used; thus, instead of saying a No. 200 sieve, the term 200-mesh screen is customarily used. The second column indicates the size of the opening in inches. The third column gives the size of the opening in microns; 1,000 microns equal 1 mm. and about 25,000 microns equal 1 in. The term "micron" is not generally used to designate the size of particles that may be measured by means of testing sieves, but is used to indicate the size of particles finer than can be measured by the finest sieves

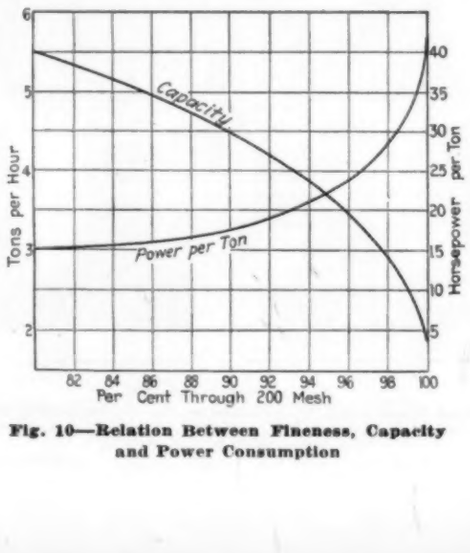



**Fig. 10—Relation Between Fineness, Capacity and Power Consumption**

obtainable and determined by the microscope. Many materials are now reduced to such minute fineness that the term "mesh" is not used, as standard testing sieves are not made fine enough to test these materials and recourse must be had to the microscope to determine the size of particle.

In this connection, we might state that the microscope is not used to the extent it deserves. In many cases it can supplant the use of screens entirely. Even when this is impracticable, it can always supplement the use of screens and a great deal of data made available that would be impossible by the use of screens. Let us take, for example, a precipitated product in which the particles are inherently small to start with. Nearly any type of pulverizer will disintegrate the filter press cake so that practically all of it will drop through the finest sieve made and it is not possible by screens alone to make a comparson as to the merits of the product obtained on the different grinding units, since all the products will practically show the same percentage passing through a certain definite-sized screen. The microscope, however, will show that one of the samples contains a higher percentage of extremely fine particles and that the average size of one of the samples is much smaller than that of the other. By means of suitable apparatus, the percentage of these particles and absolute size can be determined down to a fraction of a micron. It will also determine the uniformity of the grind, the shape and various other physical characteristics of the material, which is of great advantage in certain manufacturing operations.

For example, it is often of importance to know the general nature of the oversize left on the testing sieve; whether these tailings are extraneous materials, like grit or silica, or merely oversized particles that have not been ground fine enough. By placing these tailings under the microscope it can very quickly be determined whether these tailings consist of refractory extraneous material. Indeed, by examining the original ground product the percentage of foreign matter can be estimated to a surprising degree of accuracy. The microscope begins where the screens leave off and indicates what size the impalpable powder really is.

**Table I—Comparison of Screen and Microscopic Tests**

| | Per Cent on 350-Mesh | Microscopic Analysis of Material Through 350-Mesh | | | | | |
|---|---|---|---|---|---|---|---|
| | 40 Microns | 20–40 Microns | 10–20 Microns | 5–10 Microns | 3–5 Microns | 2–3 Microns | 2 Microns |
| Quartz | 2.5 | 21.0 | 28 | 22.5 | 10.5 | 8 | 5.0 |
| Magnesite | 2.5 | 38.5 | 34.5 | 12.0 | 6.5 | 3.5 | 2.5 |
| Barytes | 1.0 | 26.0 | 33.5 | 18.0 | 10.5 | 6 | 5.0 |
| Talc | 0.1 | 18.9 | 28.5 | 24.0 | 13.5 | 8.5 | 6.5 |
| Lithopone | 0.1 | 1.0 | 2.0 | 2.7 | 4.2 | 54 | 36 |
| Titanium dioxide | ... | 0.1 | 0.9 | 2.0 | 7.0 | 10 | 80 |
| Zinc oxide | ... | .... | 0.05 | 0.15 | 3.8 | 1.0 | 95 |

In Table I we show screen and microscopic tests of several materials. Both the zinc and titanium oxides test 100 per cent through 350-mesh and, apparently, one is as fine as the other. However, by examining the two materials under a microscope we note that 95 per cent of the zinc oxide is smaller than 2 microns, while only 80 per cent of the titanium dioxide is under this size. In a similar manner a screen test will not show any difference in size between the barytes and the talc or between the quartz and the magnesite, but the microscopic test shows in which sizes the one is finer than the other and to what extent.

In general, we might say that a filter press product or a product obtained by condensation can be ground or separated into a powder containing a high percentage of fines. Hard or siliceous materials will usually grind with a less percentage of fines than softer materials, but this does not always hold. If we examine magnesite and quartz in Table I we note there are more fines in the magnesite between 10 and 40 microns, but beyond this we find that the quartz contains a high percentage of fines. This is due to the fact that in order to grind a hard material like quartz to a fineness such that 97.5 per cent shall pass through a 350-mesh screen, it is necessary to keep it in the grinding chamber so long that by the time the most refractory particles are reduced fine enough to pass through a 350-mesh screen, the less refractory particles are at the same time reduced to an extremely fine state. If we reduce the quartz so that only about 25 per cent passes through a 350-mesh screen and then examine this 25 per cent under the microscope, we would find very few particles finer than 10 microns.

So far we have considered the production of a pulverized product irrespective of the general nature of the fines produced. It frequently happens that a granular product is required, one that does not contain any coarse particles and, at the same time, should not contain any fines.

Let us examine the data shown in Table II.

**Table II—Comparison of Different Mills**

| | Test *A* | Test *B* | Test *C* | Test *D* | Test *E* | Test *F* |
|---|---|---|---|---|---|---|
| Per cent on 20 mesh | 0 | 0 | 0 | 0 | 0 | 0 |
| Per cent on 50 mesh | 35 | 30 | 10 | 3 | 0 | 0.5 |
| Per cent on 80 mesh | 20 | 18 | 12 | 5 | 1 | 1.0 |
| Per cent on 100 mesh | 12 | 10 | 14 | 7 | 2 | 3.5 |
| Per cent on 200 mesh | 10 | 9 | 13 | 15 | 12 | 10 |
| Per cent on 250 mesh | 9 | 9 | 12 | 18 | 5 | 4.0 |
| Per cent on 300 mesh | 7 | 6 | 11 | 15 | 10 | 5.0 |
| Per cent on 325 mesh | 4 | 6 | 10 | 10 | 11 | 12 |
| Per cent through 325 mesh | 3 | 12 | 18 | 27 | 59 | 64 |

These results were obtained by grinding the same material on six different types of grinding machinery. It will be seen that, although all the machines ground the same material so that 100 per cent passed through a 20-mesh screen, there is a great deal of difference in the amount of fines they contain. Test *A* shows that 23 per cent passes through a 200-mesh screen and only 3 per cent through a 325-mesh; while we note that in Test *F* about 85 per cent passes through a 200-mesh screen and 64 per cent passes through a 325-mesh screen. Therefore, if a product is required all through 20-mesh but having very little 200-mesh and finer particles, the results shown in Test *A* are preferable to those obtained on the other machines. It will prove of interest to compare the results shown in the last two columns. You will note that Test *F* shows that the pulverized material contains a higher percentage of fines above 200 mesh than the results shown in Test *F*. The percentage passing through the 200-mesh is the same in both cases. However, it will be seen that the percentages passing through the 100-mesh and 80-mesh screens are higher in Test *E* than in Test *F*, since in Test *E* 100 per cent passes through a 50-mesh screen, while in Test *F* there is still a half per cent left on a 50-mesh. This indicates that the mill grinding the product shown in Test *E*, while not producing the percentage of fines shown in Test *F*, will, at the same time, grind more uniformly and does not contain the larger particles produced by the other machines, and for many industrial purposes its product will prove to be superior.

We will now consider another case. In the manu-

facture of a certain grade of monocalcium phosphate, the requirements are such that 100 per cent should pass through 50-mesh and, at the same time, practically 100 per cent should be retained on 200-mesh. If we look at the results shown in Table II, we shall see that none of the tests will give a product satisfying the above requirements; in fact, no machine on the market can produce this grade of product in one operation. It is here necessary to use a machine that will give the highest percentage of particles between the 50- and the 200-mesh screen with the least amount of minus 200-mesh. The pulverized material may then be passed over a screen to remove the particles larger than 50-mesh and the rest of the material either bolted or air-separated to remove the minus 200-mesh. A product will now be obtained which passes through a 50-mesh screen but remains on a 200-mesh. The oversize is usually returned to the pulverizer for further treatment, while the fines are utilized for another purpose.

Let us re-arrange the results shown in Table II, to find out which "test" will give the most economical results for producing the granular product mentioned above.

**Table III—Data From Table II Applied to Granular Product**

| | Test *A* | Test *B* | Test *C* | Test *D* | Test *E* | Test *F* |
|---|---|---|---|---|---|---|
| Per cent remaining on 50 | 35 | 30 | 10 | 3 | 0 | 0.5 |
| Per cent between 50 and 200 | 42 | 37 | 39 | 27 | 15 | 14.5 |
| Per cent through 200 | 23 | 33 | 51 | 70 | 85 | 85 |

If a 50- to 200-mesh product is required with a minimum amount of fines, then the results shown in Test *A* will give the best results, since here we have 42 per cent of granular material and only 23 per cent of fines. If a relatively larger percentage of fines is required, then the results given under Test *B* or even under Test *D* will prove the most economical to use,

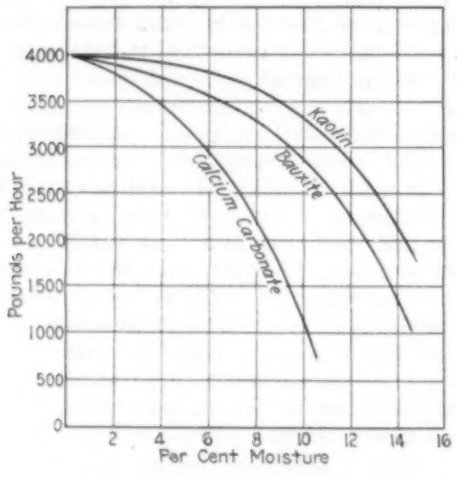



**Fig. 11—Relation Between Moisture Content and Capacity**

since in the latter we have as high as 39 per cent of granular with more than 50 per cent of fines. Therefore the question as to which type of pulverizer is the most efficient to use depends upon the size of the granular required and also upon the percentage of fines permissible.

The selection of grinding equipment depends upon the physical and chemical characteristics of the material to be pulverized. An important point to be considered is the percentage of moisture the raw material contains. In grinding most materials the capacity begins to drop off as the moisture content increases, but the rate of decrease is not the same for all materials. Some materials may contain a considerable percentage of moisture before there is an appreciable decrease in capacity. The curves in Fig. 11 show the grinding characteristics of three different materials: kaolin, bauxite and precipitated calcium carbonate. It will be noted that when the materials are dry all the capacities are about the same. As the moisture increases the capacities begin to drop, more

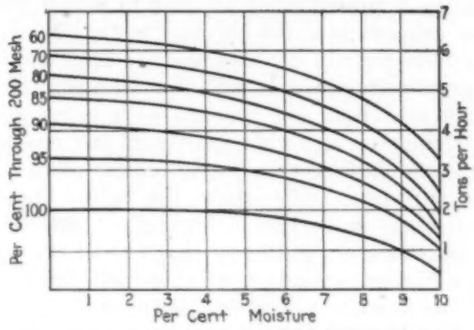



**Fig. 12—Relation Between Moisture Content, Fineness and Capacity**

rapidly with bauxite and still more rapidly in the case of calcium carbonate, so that at 10 per cent moisture content the capacity with kaolin is about three times as great as that with calcium carbonate. The data in the above table were taken at a constant fineness. The curves shown in Fig. 12 indicate the variation in capacity as the moisture content increases and at the same time when grinding to various finenesses from 60 per cent through 200-mesh up to 100 per cent through 200-mesh.

By giving careful consideration to the data given in the above curves it may often be determined how fine it is economically possible to grind and to what extent it will be economically feasible to dry the raw material before grinding.

The hygroscopic characteristics of a material also greatly affect its grinding, since a material that is very hygroscopic will absorb moisture so rapidly, particularly in a powdered state, as to decrease the capacity to a considerable extent. This factor should be taken into account in the selection of grinding equipment. Many materials will grind very easily at a low temperature, but as the temperature rises the capacity will begin to drop until the pulverizer will not grind the material at all. Let us consider the case of a material containing water of crystallization. If it is necessary to grind this material very fine, it will be found that it has to be retained in the grinding chamber so long that a considerable rise in temperature takes place. The temperature might rise to the point where the material begins to give off its water of crystallization until it becomes so wet as to preclude the possibility of being ground. Certain dyes and colors tend to become sticky and pasty above a definite critical temperature. Others tend to explode or ignite. There are also some materials which, although suffering no reduction in capacity, when subjected to a relatively high temperature will still have their color so changed as to make them useless. Therefore in grinding materials similar to the above to a fine state of division the best results are obtained when the material is passed through the

pulverizing machine very rapidly. This procedure, although giving a comparatively coarse product, will not cause any undue heating. The product discharged from the pulverizer may then be air-separated or bolted to obtain a material of the necessary fineness, and the tailings, which by this time have become cool, are returned to the pulverizer for further grinding.

In grinding some materials it is necessary to keep the pulverizer in a cold or refrigerated room to avoid the tendency of the material to become sticky. Some types of pulverizers using air separation may have the air cooled before entering the pulverizer by passing over a coil through which circulates ice water or some other refrigerating medium. Sulphur is another material difficult to grind to a fine state of division on account of the fact that it is likely to explode either on account of static charges being set up in different parts of the equipment insulated from each other or by means of a spark. By employing carbon dioxide or some other inert gas to mix with the air which conveys the pulverized product the danger of an explosion occurring is considerably lessened. The inert gas may be made by burning coke or oil and introducing to the pulverizer the products of combustion consisting of carbon dioxide and nitrogen. This makes an excellent gas to use and can be produced much cheaper than the commercial carbon dioxide.

From what we have stated above it is seen that the selection of the proper pulverizer should be done along scientific lines and be just as carefully made as in the selection of other chemical equipment. After all, in the majority of cases, pulverizing is the final step through which a chemical passes before reaching the market. If not ground uniformly to the proper fineness it will prove undesirable regardless of how much merit it might possess from a chemical viewpoint. By proper choice of modern grinding equipment, the pulverizing department can be kept as clean and dustless as any other part of the plant. Dustless operation is economical operation. Maintaining a clear atmosphere in the grinding room not only will eliminate much wear and tear from auxiliary equipment, such as belts, bearings and motors, but at the same time will decrease accidents and in general be conducive to the health of the operating force.

# Egypt's Chemical Industries

## Land of the Pyramids Far From Deficient in Chemical Development

**By Henry L. Geissel**
Thoune, Switzerland

ALTHOUGH the land of the pyramids lacks many of the resources necessary for the establishment of extensive industrial enterprises, the presence of such raw materials as salt, natural soda, limestone, cotton and sugar cane has given rise to a number of industries that are chemical in nature. A survey of these shows that Egypt is far from deficient in chemical development.

### Caustic Soda From Natural Alkali

At Wadi-Natron, in the Lybian desert, caustic soda is made from the raw sodium carbonate of the alkali lakes. Steam dredges and shovels transfer a slurry of carbonate crystals and mud from the lake to dump cars, in which it is hauled to the factory. Here water is added in mixing tanks, the clear solution drawn off after settling and causticized with lime obtained from extensive limestone deposits underlying the region. Concentration in vacuum evaporators and subsequently in cast-iron kettles yields fused caustic soda, which is filled into sheet-iron drums for sale to soap factories, oil mills, etc., and for export to Syria, Palestine and Greece. It is interesting to note that this plant was started by a Swiss company and that the late Prof. George Lunge, of the Zurich Polytechnic Institute, was for many years its general manager.

### Salt by Solar Evaporation

Recovery of salt from sea water by solar evaporation at two plants near Alexandria and Port Said has been extremely profitable. The Port Said Salt Association, for example, paid a 200 per cent dividend in 1918 and 250 per cent in 1919.

At the beginning of summer, the basins are filled with sea water. Wooden piles are set at regular intervals in the bottom of the basins and as the solution becomes concentrated these piles form a nucleus for the development of clusters of salt crystals pure enough to be used as table salt without further treatment. Before all of the water has evaporated, the mother liquor is pumped back to the sea. During the winter the rain washes the deposited salt. In the spring the basins are drained and the harvest begins. A network of narrow-gage tracks is laid on the basins and the salt is brought direct to the mill, where it is ground into different grades and packed in bags for shipment.

### Cottonseed Oil

Cotton, the principal product of Egypt, offers opportunities for chemical development in connection with textile bleaching, dyeing and finishing, but little has been done so far. On the other hand, an excellent industry has developed from the utilization of the cottonseed, plants in Alexandria and Kafrez-Zayat ("village of oil merchants") producing daily about 40 tons of crude cottonseed oil. This is refined by alkali treatment, bleaching, deodorizing and chilling to remove stearine according to American methods. Much of the resulting salad oil is consumed in Egypt; the remainder exported to various European countries.

### Sugar and Paper

Sugar cane plantations of upper Egypt are able to supply the entire domestic demand for refined sugar. There are five very extensive plantations, with a modern refinery near Helouan.

Quite a large paper mill is located at Alexandria, but it is not able to meet the demand, particularly for cigarette paper.

Among other industries may be mentioned: cement, lime and brick works at Cairo and Alexandria, the largest cement works getting their limestone from Dalmatia; the gas plant at Alexandria, which produces ammonium sulphate as byproduct.

### Diesel Engines Favored

For power, the steam engine has been in great favor, although there is a marked trend toward Diesel and semi-Diesel motors. American windmills are also in demand.

# Arc Welding With Metallic Electrodes

## A Discussion of the Fundamentals of an Economical Means of Fabrication That Should Find Extensive Application in the Chemical Equipment Field

**By W. L. Warner**
Industrial Engineering Department, General Electric Co.

ELECTRIC arc welding utilizes the heat liberated in the arc stream and at the terminals of an electric arc, properly to fuse the metals so they will form a solid homogeneous mass. The arc melts a small pool of metal on the work and additional metal from a wire or rod is melted by the heat of the arc and is deposited in this pool in a molten state. The heat of the arc causes the molten metal in the pool to circulate and mixes the original and added metal so that a firm union between the old and new metal is formed when the metal cools.

When the welding arc is drawn between the metal to be welded and a metal wire electrode, the process is called metallic arc welding. When a carbon or graphite rod is used for one terminal of the arc, the process is called carbon arc welding. Both methods are generally known as fusion welding. For the majority of arc welding work the electrode is simply a metal rod or wire that supplies the filler metal. The arc is struck between the metal electrode and the work and instantly fuses the end of the electrode, carrying this metal to the work. Metal can thus be deposited on vertical surfaces or in any direction and the electric arc provides by far the best means by which metal can be successfully deposited overhead.

The metallic electrode process requires a comparatively low energy input. The metal deposited is more likely to be homogeneous and a weld so made has a smoother and more regular appearance than one made by the carbon electrode. For these reasons the metallic electrode is extensively used.

The carbon electrode method is often used for building up metal, plugging holes in castings, welding and joining parts if appearance is not essential and speed is desirable. Metal can be built on by melting from a rod of filling material in a manner similar to soldering with an iron or welding with a gas torch. An arc is formed by current flowing across a gap in an electric circuit. A small amount of the material forming the terminals of the arc gap is heated to an incandescent vapor. This vapor provides the material in the arc stream by which the current passes from one terminal to the other.

The terminal from which the current passes to the arc is termed the anode, and the terminal to which the current passes from the arc is called the cathode. The exact distribution of the heat in the arc between the two electrodes and the arc stream is still a matter to be determined. It is, however, well known that the greater portion of the total heat of the arc is liberated at the positive electrode. When direct current is used, one terminal remains the positive continually and the greater portion of the total heat is liberated at this terminal. When, however, alternating current is used, the terminals are alternately positive and negative so that approximately the same amount of heat is liberated at each terminal. In direct-current welding circuits, the positive is usually called the ground lead or ground terminal.

Arc welding as ordinarily practiced is an art. But in common with most of the arts, it has a substantial background of engineering principles. Mr. Warner's presentation of the effect of arc characteristics and the physical condition of the metal to be welded should help extend the usefulness of the art of electric arc welding. Another but more specialized article on welding will appear in an early issue.

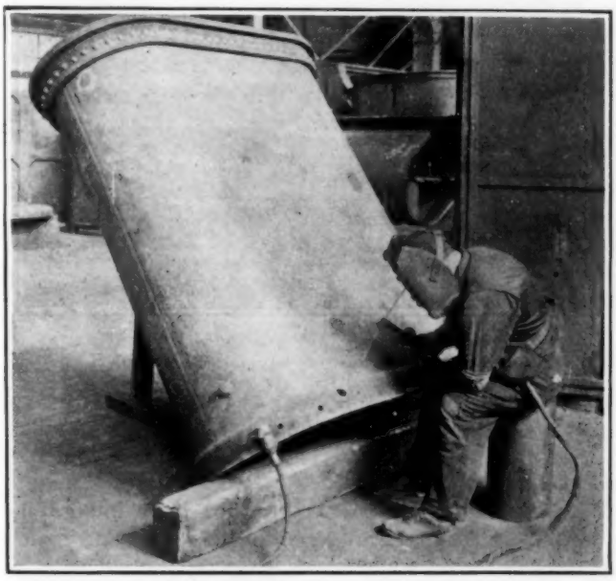
Usually the piece of metal to be welded is considerably larger and has more mass than the electrode, so that the loss of heat at this point will be a maximum due to its being conducted back into the body of the metal. Consequently it is desirable to have much heat liberated at this point to make up the losses and to bring the temperature of the metal to the fusing point at the same time that metal from the electrode is fused and deposited. For this reason, direct current is generally used for arc welding, and in the welding of iron or steel the piece to be welded is usually made the positive terminal of the arc. However, in case very thin metal is being welded, it is frequently advisable to reverse the polarity to prevent the arc from puncturing the metal. In the welding of some metals, such as manganese steel, bronze, etc., it is often necessary, for other reasons, to reverse the polarity and make the electrode positive.

The polarity of a circuit can be determined in a number of ways. The simplest and most positive way is to determine it by means of a voltmeter. Another method is to draw an arc between either a bare metallic electrode or a carbon electrode and a steel plate. If the plate is positive and the electrode negative, the arc will be fairly stable. If, however, the circuit is reversed and the electrode is positive, the electrode will heat up very rapidly and the arc will become "wild" or it will flutter and it will be hard to keep it going. With reversed polarity the penetration with the metallic electrode is poor and the deposited metal can be very easily knocked loose.

The intensity of the light produced by the arc is so great that darkened glass must be used in order to observe the arc. When suitable glass is used, the different portions of the arc can be plainly distinguished from one another. The center of the arc is usually referred to as the arc core (and some observers are able to see that this is divided into two portions designated

as "arc core" and "arc stream"). In general, this portion of the arc will usually be greenish in color, of comparatively small diameter and forming a direct line between the two terminals of the arc. The point where the arc core strikes on either terminal is seen as a light red or yellowish spot considerably brighter, and therefore hotter, than the metal surrounding it. The metal around this spot is molten and is usually seen as a bright red area. This color gradually shades off into darker red with lower temperatures and finally becomes black at a short distance, not over ½ in. from the arc, except in the case of very heavy welding. Slag, oxides, etc., can be distinguished floating on the molten metal either as light or dark spots, depending upon the melting point of the impurity. Surrounding the arc core is the arc flame, which is irregular in shape and in constant motion, being easily deflected by magnetic fields due to the current in the electrode and in the plate and also by drafts that may arise by reason of the heat in the arc or by exposure to wind, etc.

At the point where the arc strikes the plate, assuming that current, polarity and speed of travel are correct, the metal is melted and seems to be forced out of the pool by some sort of blast from the arc. This results in the metal piling up around the edges of a small depression in which the metal is in a molten state. This depression is known as the arc crater and its depth provides a means of observing the penetration during welding and, to a certain extent, of predicting the

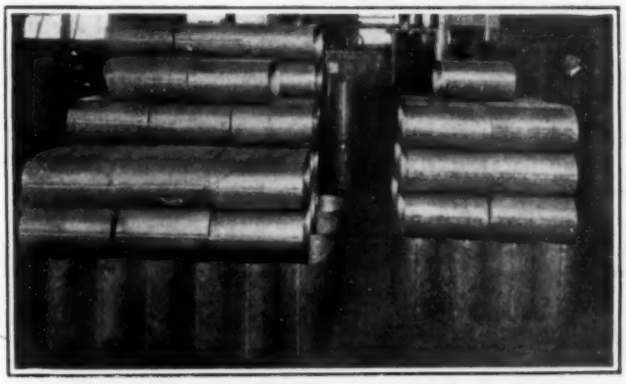


**Welding on the Base in Making a Sheet Steel Tank by the Metallic Arc Method**

soundness of the weld, as the first requirement of a weld is to secure good penetration. The crater depth will depend upon the thickness of metal welded, but in general should be at least $\frac{1}{16}$ in. Correct penetration will make certain that the metal of the plate is melted and in condition to receive the metal projected from the electrode, also that the area of the crater will be sufficient to receive all the metal from the electrode and not permit any of the deposited metal to overlap on the solid metal of the plate where it will not stick.

While the correct arc length alone will not insure good welds, it is agreed that a long arc is almost certain to result in a poor weld. A good weld is dependent on the heating effect of the arc. The plate or work is heated by the release of energy at the terminal of the arc, by radiation and conduction from the arc core and stream, and from the hot surface of the electrode and also by the hot metal deposited on it from the electrode. With a short arc, this heat is concentrated on the plate, whereas with a long arc, much of it is lost into the surrounding space. Consequently, with a short arc a greater portion of the energy is transformed into useful heat.

A long arc is not as stable as a short arc and tends to wander over a considerable area on the plate, and



**Steel Tanks Being Fabricated by Electric Welding**

A comparison of the speed of automatic and bond work is seen in the sizes of the two piles.

the arc flame blows about rapidly. This action, together with the greater length of the arc, affords considerable opportunity for the air to come in contact with the metal passing from the electrode to the plate and also in contact with the molten metal in the arc pool or crater. This results in the absorption of oxygen and nitrogen, both of which are detrimental to the quality of the weld. With a short arc, the flame, consisting of vapors coming out of the arc, acts as a protection and prevents very largely the absorption of these outside gases.

The expression "short arc" really means very little, as it is greatly affected by the electrode diameter and current used. With ¼ in. diameter electrode and 250 amperes or more, the arc will be from $\frac{1}{16}$ to ¼ in. long, and the arc voltage will be from 22 to 25. If, however, a $\frac{1}{16}$-in. electrode is used with a current of 40 amperes, the arc length may be less than $\frac{1}{16}$ in. and the arc voltage from 15 to 18. In general, the arc should be held just as short as possible without causing the electrode to touch the work and to put out the arc. The operator learns by observation when a short arc is being held. It is possible to tell by sound only, with low-carbon steel electrodes, whether the arc is long or short. If the arc makes a rapid crackling sound that is fairly steady in intensity, the arc is short. The sound of a short arc is very much like the frying of grease in a pan. If the arc makes a hissing sound punctuated by explosions occurring at intervals of from ½ to 1½ seconds, the arc is too long. A short arc throws a steady shower of small sparks, whereas each of the explosions caused by the long arc scatters a considerable number of larger globules of metal.

The above discussion refers to the metallic arc of the arc between a metal electrode and the metal of the piece being welded.

The current in the arc passes through a path of

highly heated vapor from the materials forming the terminals of the arc. If this vapor cools, the arc will go out or will at least vary greatly in the resistance and amount of current and heat. Special metallic electrodes are often provided with a coating the function of which is to provide this vapor and maintain the arc, thus making it more stable. Occasionally the welder will come across steel electrodes with which it is impossible to maintain an arc due to its "wild" or unsteady action. This condition is often remedied by dipping the electrodes in lime water. On drying, a small amount of the lime sticks to the wire and this is sufficient to steady the arc and make the material useful.

A high open circuit voltage will also make the arc more stable, as excess voltage is available to re-establish the arc if for any reason it starts to go out. A reactance coil in series with the arc acts in a similar manner, and particularly on very light work with low currents the reactance coil is of great value.

It has been found that the welding current flowing in the electrode under some conditions sets up a magnetic field, causing the arc to become "wild." Slanting the electrode forward or backward has an effect on this condition. The path of the current in the work also occasionally causes this trouble. Generally speaking, one welds away from the ground connection, but sometimes a change in the location of the ground connection will eliminate undesirable magnetic fields and the arc will become steady.

Steam or vapors will make an arc unstable and may cause it to go out frequently, to the detriment of the weld. Such a condition might arise in sealing a crack in which some oil or water remains. As the metal is heated this matter turns to a vapor and rises through the crack into the arc.

### Elements to Be Welded Must Be Clean

Some impurities affect a weld by weakening it, others by making it brittle and others by making the deposited metal so hard that it cannot be machined conveniently. Gas pockets, slag and oxides will materially weaken a weld and can be eliminated by using a short welding arc and by keeping the weld and electrodes clean. Grease and dirt on the surfaces to be welded, or in the electrode, will result in gas pockets or slag inclusions, and a long arc will result in oxidized or burned metal.

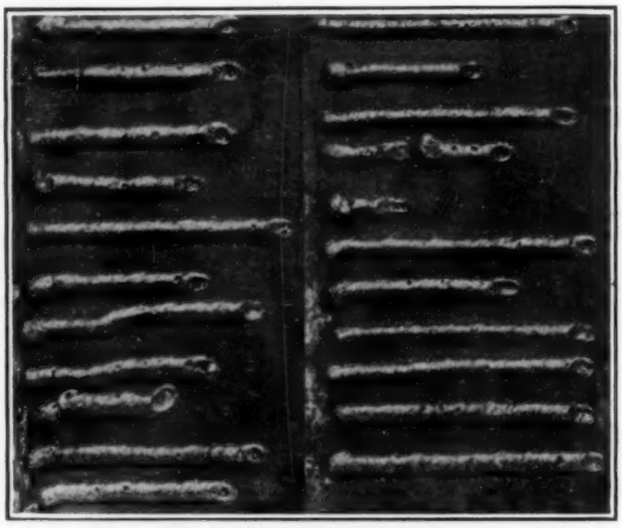
Brittle and hard welds are often caused by a long arc that permits the hot metal to be exposed to the air with the consequent absorption of nitrogen, which has been largely blamed for brittle welds. This is particularly true of welds on metal if the carbon content in either the electrode or the work is 0.30 per cent or more. Oxidized metal will also cause brittle welds. If oil and grease are not thoroughly removed, the residue, which is burned during the welding, will enter the weld and make it hard.

The weld should be kept clean at all times. Before beginning a weld the work should be thoroughly cleaned along the joint by means of a scratch brush or sand blast to remove scale, and grease should be removed by washing with gasoline and alkalis, or a sand blast may be used. As the weld progresses, the metal adjacent to where the arc stopped should be cleaned each time an electrode is changed. This can be done with a scratch brush.

Porosity is caused by the inclusion of gas-forming material in the weld, such as dirt; by poor electrodes or poor metal in the work; by excessive heat causing the molten metal to boil; or by not properly welding over the joint where the arc is stopped.

In general, the metallic electrode for welding the commercial grades of wrought iron, plate, structural and cast steel, and to a considerable extent of cast iron, should be a high grade of low-carbon steel wire that has a carbon content of 0.20 per cent or less. Practically all commercial electric welding wire on the market meets this requirement, although there are a number of special electrodes containing greater amounts of carbon which are used for special purposes. The medium- and high-carbon steel electrodes are used where a hard deposit is required, but are not generally satisfactory where strength is necessary. In ordering "electric welding wire" should be specified, as wire for acetylene welding is often treated in such a way as to render it unsuitable for electric welding.

The electrode wire should be cut into pieces convenient for the operation. A length of 14 to 18 in. is



**A Group of Weld "Beads"**
Notice the crater where the arc has been broken.

satisfactory, as it is about the greatest length an operator can handle; at the same time it reduces the number of times the electrode is changed, and consequently the wastage.

With an electrode that is red hot it is impossible to either start an arc or maintain one. The exact temperature varies with different electrodes, but in general it is advisable to keep the electrode cool. The passage of the welding current and the heat conducted back from the tip tend to heat that portion of the electrode wire carrying current. Accordingly when the welding current is high for the electrode size, the wire should be gripped in the middle. By this means the portion carrying current is all consumed before it has time to become too hot for use. With lower current, the electrode is gripped by the end to save time and to keep down the number of times the arc must be struck.

The same size electrode may be used with various thicknesses of plate. The heavier plate will require the use of heavier currents. The electrode wire should be uniform throughout its length in composition and hardness, since these factors affect the melting point and the way the electrode will work in the arc.

# Accident Prevention as a Means of Increasing Productive Efficiency

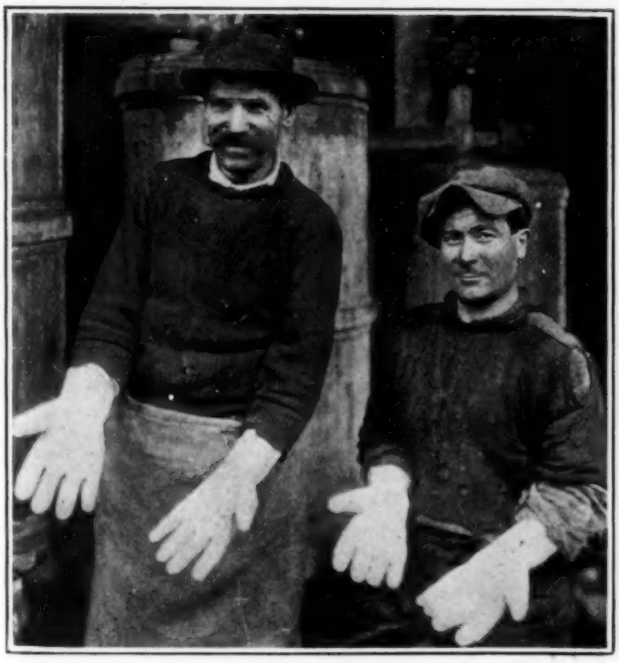
## Technical, Economic and Humanitarian Phases of Industrial Accident Prevention Discussed at the Baltimore Safety Conference Held on Jan. 23

**Editorial Staff Report**

MOST OF US can recall vividly the numerous reviews of returned soldiers during the early months of 1919. If the marching soldiers were in column of fours formation, it would take more than 2 hours for 23,000 of them to pass a given point. This is a picture of the number of men and women killed in our factories and mines during 1924. It means that our industrial prowess is more costly in human life than was the battle of the Argonne forest in which 22,000 Americans gave their lives. If we capitalize these lives on the basis of the modest wage of $1,000 a man-year, we have an annual destruction of wealth of $383,000,000. But this is not all. Of a total of more than 3,000,000 industrial accidents, 678,000 workers were injured to such a degree that at least 4 weeks time was lost. The resultant direct loss in wages, plus compensation and the cost of medical treatment, is more than $1,000,000,000 every year. Such is the magnitude of the job of industrial accident prevention so well outlined at the Baltimore Safety Conference held on Jan. 23.

The conference afforded an excellent cross-sectional view of the present trend in all phases of safety engineering. The local council, co-operating with the American Society of Safety Engineers and the Engineering Section of the National Safety Council, obtained speakers of widely varying interests, thus making an unusually well-balanced program. With the exception of several brief papers, the program was distinctly partial to the more indirect factors in accident prevention, such as industrial lighting, ventilation, maintenance of plant and equipment and managerial policy relative to safety. Direct factors such as machine design, mechanical safeguards and safety instruction were distinctly in the background. For the present at least, this is placing emphasis where it belongs, as the most liberal estimates show that mechanical safeguards do not prevent more than 10 per cent of accidents, and as everyone experienced in the art of handling men knows, even the most repeated and thorough safety instructions may have but little effect on accident frequency. But an improvement in shop environment is a different matter. Good lighting, clean workshops, fresh air and properly installed electrical equipment make for safety—and safety usually means increased efficiency, as has been proved by many of our largest industrial enterprises and notably by the U. S. Steel Corporation.

**Acid Burns Are Common**
A good way of preventing them or of lessening their effort is immediate submergence in lime water



**Protective Equipment in the Chemical Industries**
Rubber gloves are made to be worn, and they should be free from holes, too

The development of the safety movement is a story replete with interest, and it was told simply and effectively by H. C. Price of the Bethlehem Steel Co. Passing from a stage of ridicule to one of debate, and finally to a position of powerful influence, all in 10

years, is the proud record of the safety movement in the United States.

Safety work divides logically into three phases from the standpoint of administration: planning, execution of plans and measurement of results. Planning a program of safety work is prompted not only by possible increased efficiency but by economic pressure on the employer for reduction in labor turnover and in operating cost. The program must then be sold to the management, foremen and workmen. This is greatly aided by providing mechanical safeguards, safe tools, special clothing and facilities for first-aid treatment. Bulletins, posters and personal instruction are stimulating also. The employer having shown his sincerity in safety work, the time becomes ripe for the efficient execution of his plans.

The Bethlehem Steel Co. has found that placing responsibility on a large number of safety men, each having his own shop committee for safety, is an effective means of execution. The element of group pride in safety work is a big factor. Cash prizes are awarded every month for the best suggestions. Bad accidents are featured by means of pictures and text in all departments of the plant.

**Safeguarding Rolls in the Rubber Factory**
A simple, but positive clutch release operated by slight body pressure

### Results of Persistent Safety Work

Here are some of the results of persistent safety work in the Bethlehem plant: In 1914, 17 eyes were lost; there were on the average 75 lost-time accidents monthly, and 17 per cent of these accidents were attributable to machinery and equipment. Last year, one eye was lost; the average of lost-time accidents has dropped to less than 20 a month, and the safeguarding of machinery has reduced accidents from this cause to 3 per cent. These results can be traced to the sense of responsibility for safety shared alike by every member of the organization, from the general manager to the workmen.

Dr. Samuel W. Wiley, of Wiley & Co., urged the appointment of plant chemists to safety committees.

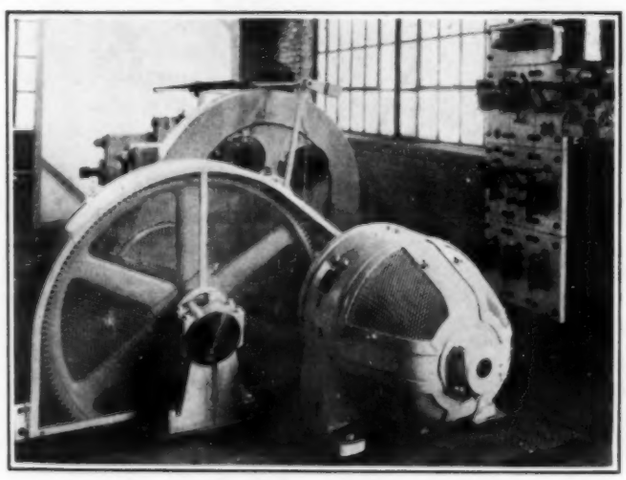
**An Effective First-Aid Device**
The ordinary drinking fountain has saved many an eye from caustic burns

Potential hazards can often be located and lessened in this way. Some of the common laboratory and chemical plant hazards are: the leakage of strong acids from pipe lines and storage vessels, the evaporation of solvents such as ether and benzol into confined rooms, the discharge of volatile solvents into sewers, the storage of solvents in drums exposed to strong sunlight or other sources of heat, and the storage of concentrated sulphuric acid near organic matter or active chemicals. Periodic inspections by a chemical safety committee is an effective means of minimizing such hazards.

### Safety From the Surgeon's Standpoint

Safety from the surgeon's standpoint was the theme of R. W. Locher, an industrial surgeon of long experience. Although the surgeon begins his work when accident prevention has failed, there is still an opportunity for prevention in the broad sense—keeping small, seemingly insignificant injuries from developing into serious and perhaps fatal ones. Thus, the big task of the industrial surgeon is the prompt and adequate treatment of small injuries. Experience has shown that the small wound is the most dangerous of all, as it usually is neglected, allowing infection to get in its deadly work.

From an economic standpoint, adequate medical attention should be available to every plant. The usual minor injury costs $15 to treat and takes $5 of productive labor from the plant, making a total cost of



**The Ideal in Safe Electric Drives**
Here the motor, reduction gears and switchboard are properly guarded

$20. If treatment is neglected, the $20 may be saved, but should infection develop, as it often does, the employer is liable for a maximum of $500 medical treatment, as provided by law, to say nothing of the cost of lost production, labor turnover and partial or permanent disability awards. Ultimately the employer pays for his neglect many times over, as his liability insurance rate is determined by the accident record in his plant. Although a small plant cannot afford the ideal equipment, which is a small hospital, it can have the service of an insurance company's casualty hospital or surgeon.

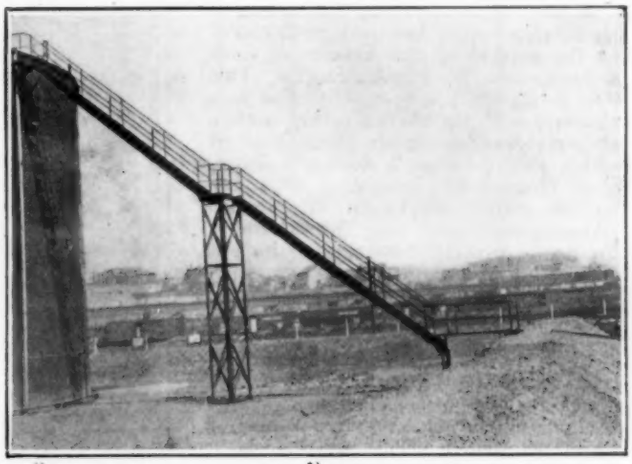
Safety should appeal to the employer for humanitarian reasons also. Some plant managers would be hard pressed to explain why their mechanical equipment received careful attention when the policy of human upkeep was one of gross neglect. Such neglect on the part of the employer may result in further legislation to protect the industrial worker.

Recent progress in safety engineering as applied to electrical control devices was outlined by R. L. Allewelt, of the General Electric Co. The electrical machinery maker of today is studying machine protection, and the safety of the operator and electrician.

**Preventing Tank Accidents**
The short ladder removes the possibility of falling into the tank.

The ideal fused disconnecting switch from a safety standpoint is inclosed in a metal box and has an externally controlled handle, so arranged that the cover cannot be opened unless the switch is in the open position. Recent practice is toward inclosed rheostats and motor starting devices, as well as fully protected manually operated switches. Another important development is the magnetic switch that is controlled by a push button remotely placed, thus enabling the operator to give full attention to his productive work. Such magnetic switches are provided with under-voltage protection, so that a failure of power will cause the switch to open. In the absence of this important safeguard the operator might be caught in moving machinery upon the resumption of power.

C. J. Stahl, of the Westinghouse Electric & Manufacturing Co., emphasized the great effect that illumination has on production. Better illumination is being demanded by safety organizations and plant managers. Some of the tangible effects of good lighting are better workmanship, less eyestrain, reduced spoilage, greater accuracy, cleanliness in the plant, increased production and easier supervision. Statistical analyses show that 23 per cent of industrial accidents are caused by faulty



**Safety in the Oil Refinery**
The sprawling and well guarded stairs, leading to elevated earthwork, reduce serious hazards in case of fire.

illumination, and it is significant that the minimum requirements for proper visibility in a plant are far above that for safe working conditions. This means that an investment in safe lighting is also an investment in increased and better production.

### Hazards From Dust, Fume and Benzol

Perhaps the best prepared paper of the conference was that by Dr. Leonard Greenburg, of the U. S. Public Health Service and Yale Medical College. After outlining the history of ventilation theories, Dr. Greenburg told of recent investigations on dust removal, fume control, benzol poisoning and the principles of ventilation engineering. Good ventilation is largely a matter of proper temperature and humidity limits, and under certain conditions of high temperature air motion is also a factor. Carbon dioxide content and the presence of odors have practically no effect upon health, at least in ordinary room and factory conditions.

Dust removal has a direct bearing on safety, as most eye injuries are caused by flying particles. In one instance the dust content surrounding a tumbling barrel containing sand was reduced from 6,000,000 to 189,000 particles per cu.ft. by a well-designed exhaust system. Proper air velocity in the range of the dust is the controlling factor in fan design; but the size of the particles has some effect, too.

Benzol poisoning is inexcusable from the standpoint of safety engineering. In four plants equipped with exhaust fans, the maximum concentration of benzol was 160 p.p.m. which is a safe atmosphere; and in other plants not so equipped, the concentration ranged from 231 to 4,000 p.p.m. Further investigations relating to benzol poisoning in every type of industry are now in progress.

# Equipment News

*From Maker and User*

## High-Temperature Insulation

A new insulating brick for service at high temperature has just been placed on the market by the Armstrong Cork & Insulation Co., Pittsburgh, Pa. This new insulation has been developed particularly with the idea of giving service at temperatures higher than those at which this company's formerly developed "Nonpareil" insulating brick can be successfully employed. It is called "Armstrong's Insulating Brick," and is for use in industrial heating equipment where the temperatures encountered on the side of the refractories away from the combustion chamber are above 1,600 deg. F.

These bricks are made of diatomaceous earth mixed with a binder and finely ground cork. They are molded to shape and fired at a temperature of over 2,000 deg. F. This serves to burn out the cork and leaves a large number of minute air cells. These, in combination with the microscopic air cells natural to the diatomaceous earth, are what impart to the brick its insulating value.

The conductivity of this new brick is said to be 0.82 B.t.u. per sq.ft. per deg. F. difference in temperature for each inch of thickness, per hour at 500 deg. F. and 1.00 B.t.u. at 2,000 deg. F., these figures being only $\frac{1}{4}$ to $\frac{1}{12}$ those for ordinary firebrick.

It is said that this new insulation also possesses the ability to stand up under high temperatures without disintegration, shrinkage or loss of insulating properties. The crushing strength is 200 lb. per sq.in. The weight of a standard 9x4½x2½-in. brick is about 2 lb. While this brick is said not to shrink or fuse at temperatures in excess of 2,000 deg. F., it is not a refractory. It is put forward for use only as a lining for backing up a refractory wall of a suitable thickness for the service, and under these conditions is claimed to give satisfactory results under temperatures up to 2,100 deg. F., which would indicate a temperature in the combustion chamber above the practical working range.

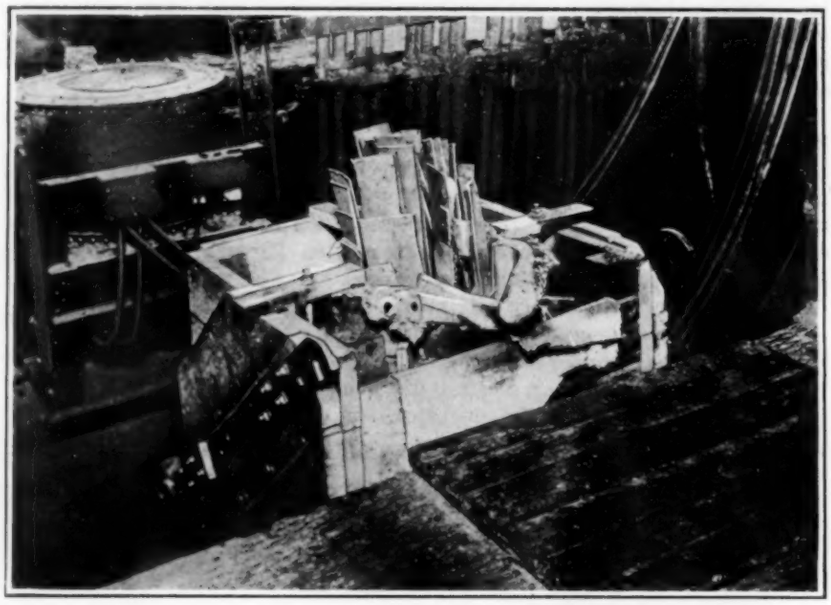


*Fig. 1—600-lb. furnace for melting copper and nickel-silver by high-frequency induction. Furnace after being completely emptied melts a new charge of 600 lb. of copper strips, as shown, in 1 hour and 9 minutes*

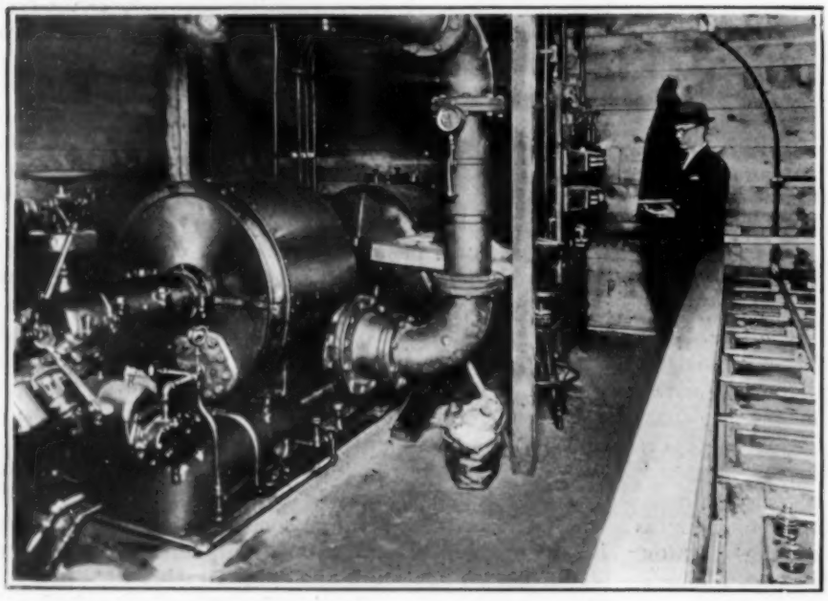


*Fig. 2—Turbo-generator delivering 100 kw. or more of high-frequency power and condensers for power factor correction for furnace illustrated in Figs. 1, 4 and 5*

## High-Frequency Inductive Heating

**By Dudley Willcox**

Ajax Electrothermic Corporation, Trenton, N. J.

High-frequency currents have been applied to melting and heat-treating operations on a laboratory scale for 7 or 8 years. Commercial installations have been made for producing alloys of nickel-iron, gold-platinum, osmium-iridium and other metals that require high temperatures, freedom from contamination and thorough mixing. High-frequency furnaces are also used commercially for melting metals of the tungsten group in graphite containers for producing carbides. Their potential uses are numerous.

The principle of these furnaces is that of a transformer in which the primary is a coil of copper conductor and the secondary is a mass of conducting material within the coil. Many induction furnaces have been designed on the principle of an iron core transformer in which the secondary is a loop of molten metal. They have large radiating surface and attendant troubles with refractories. The high-

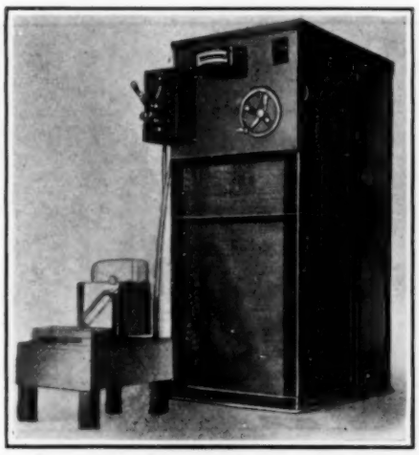


*Fig. 3—20-kw. high-frequency converter and small high-temperature furnace installed in the laboratory of the International Nickel Co.*

frequency furnace may have a bath in the form of a cylinder which has small radiating surface for a given volume. The metal bath may be contained in an ordinary crucible. The current in the coil does not heat it much above room temperature, but the mass within the coil is rapidly heated to the melting point and higher, if desired. As in ring type induction furnaces, the metal is stirred by electro-magnetic forces so that thorough mixing of alloys is assured.

The usual form of high-frequency "converter" consists of a reactance, a step-up transformer, a special form of discharge gap, and a bank of condensers. Current from sixty-cycle power lines is changed to oscillatory current having a frequency which is the natural period of the furnace circuit. A high-frequency converter and a small furnace operating from it are shown in Fig. 3.

Fig. 1 shows a high-frequency furnace operated from a rotary high-frequency generator. Fig. 2 shows the generator driven by a steam turbine operating with 110 lb. steam pressure. A bank of condensers shown at the right of Fig. 2 serves to correct the power factor of the furnace circuit. In place of the steam turbine an oversize synchronous motor to drive the generator can be used to correct the power factor of the primary power supply lines.

The furnace illustrated has been used for melting nickel-silver and copper, and the stirring effect is pronounced as in the case of smaller furnaces operated with oscillatory current. In a little more than an hour, with a power input of about 100 kw., 600 lb. of copper can be melted.

Fig. 4 shows the furnace containing molten copper being poured into a series of iron molds. The power can be applied during pouring if necessary to keep the contents at the proper pouring temperature. Fig. 5 shows the crucible poured clean except for the charcoal that is used to prevent oxidation of the copper during melting.

Another very interesting high-frequency furnace installation was made recently at the Westinghouse Electric & Manufacturing Co. in East Pittsburgh. They are melting nickel-iron and silicon-iron alloys in 225-lb. lots, operating their furnaces from a 5,000-cycle generator, driven by a direct current motor. The generator is rated at 100 kw. and practically the full power is delivered to the furnace circuit. A melt takes less than an hour. The necessity for keeping the carbon content of their alloys to the astonishingly low figure of 0.006 per cent or less makes it necessary to use a non-carbonaceous crucible. The zircon crucibles used last for only one heat, but the cost of melting is nevertheless considered low. Some of their melting is done under a vacuum and some under hydrogen. The furnace construction lends itself admirably to either. A section of an early design of the furnaces used in this installation is shown in Fig. 6. An etched section of an ingot of nickel-iron alloy weighing 225 lb. is shown in Fig. 7. Not the least interesting feature of their production is that the ingots are not cropped. It will be observed from Fig. 7 that the ingot has a flat top. While there are a few shrinkage holes near the top, they are found to weld on forging and the entire ingot is rolled. A full technical and

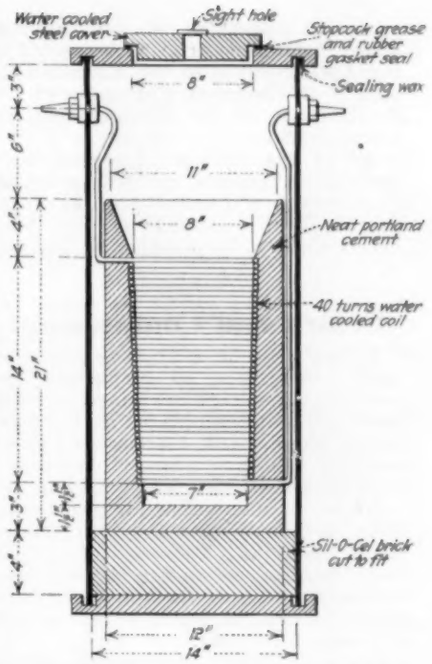
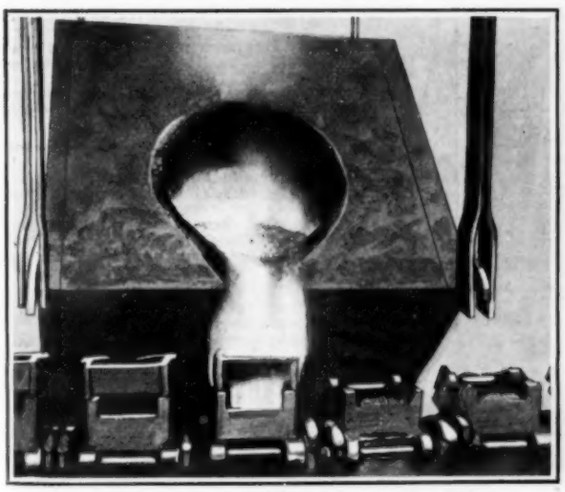
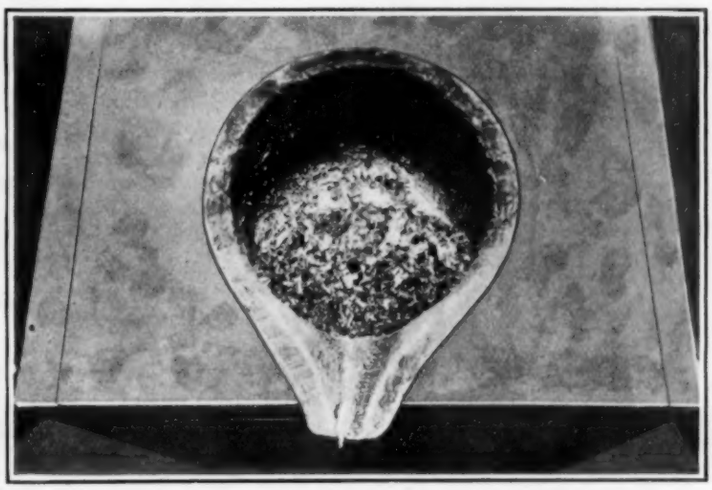



*Fig. 6—Sectional drawing of high-frequency non-pouring furnace used for melting electrolytic iron and nickel*

*Fig. 7—Etched section of 225-lb. ingot of nickel-iron alloy produced in 100-kw. high-frequency induction furnace*





*Figs. 4 and 5—Left: 600-lb. charge of copper being poured into iron molds. Right: Interior of crucible in 600-lb. high-frequency induction furnace, shortly after pouring*

economic discussion of the Westinghouse installation is to be presented at the April meeting of the American Institute of Electrical Engineers by Dr. P. H. Brace of the Westinghouse research staff.

All of the furnaces described were made under patents granted to Dr. E. F. Northrup of Princeton, N. J. These patents are controlled by the Ajax Electrothermic Corporation of Trenton, N. J.

## Centrifugal Compressors

A new line of multi-stage, centrifugal compressors, to supplement the line of single-stage machines recently developed, has been placed on the market by the General Electric Co., Schenectady, N. Y. These compressors have been developed for furnishing various volumes at higher pressures than those ordinarily obtained with single-stage machines. They are of a type well fitted for use as gas boosters, gas exhausters, in pneumatic material handling systems, in liquid agitation and for furnace blasting.

The main line of compressors covers water-cooled machines designed to deliver from 3,000 to 60,000 cu.ft. per minute at pressures up to 30 lb. or more. Two types of miniature, self-cooled machines, are designed to deliver from 250 to 1,400 cu.ft. per minute at pressures of from 2 to 6 lb. All types are arranged for either motor or turbine drive.

Among the installations already made are two 8,500-cu.ft., 16-lb. machines for the Utica Gas & Electric Co., an 8,000-cu.ft. 70-lb. machine for the New Bedford Gas & Electric Co., four 25,000-cu.ft., 35-lb. machines for the Public Service Co., of New Jersey; two 45,000-cu.ft., 25-lb. pressure units for the Mystic Iron Co.; a 6,900-, a 12,000- and an 8,200-cu.ft. machine for pressures of 27, 63 and 28½ lb. respectively, for the Gillette Safety Razor Co., and an 8,300-cu.ft., 16-lb. machine for the Metropolitan Utilities District of Omaha. All these machines are turbine driven.

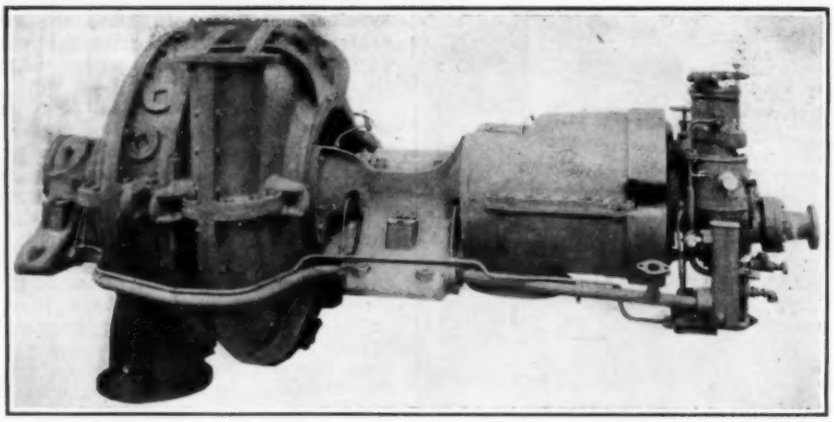


*Fig. 1—Centrifugal Compressor Rated WM-435-8,500-15.8-5,700, Driven by D-51 Curtis Steam Turbine*

Each complete unit has four bearings with an automatically lubricated flexible coupling. These bearings are supported by the foundation or base under the machine. The governors, improved in design, include constant volume governors, constant suction governors and constant pressure governors.

## Coal Meter for Stokers

A new coal meter for use with the chain grate type of stoker has been brought out by the Republic Flow Meters Co., Chicago, Ill. This meter is of the revolution counter type. It translates revolutions of the driving shaft of the chain grate into amount of coal fed by the application of a factor derived from the gate opening and the travel of the grate. This gives the coal feed by the stoker in terms of volume, a figure that is not influenced by moisture in the coal and that varies but little with coal size.

## Manufacturers' Latest Publications

Walsh Fire Clay Products Co., St. Louis, Mo.—A 160-page book entitled "Refractory Facts," containing a description of the Walsh plant, a discussion of fireclays and their chemistry, a complete catalog of Walsh products and 70 pages of tables and other useful information for users of refractories.

Hardinge Co., 120 Broadway, New York.—Bulletin 17. A new bulletin describing Hardinge Air Classifiers for use with Hardinge conical mills.

Bailey Meter Co., Cleveland, Ohio.—Bulletin 10. A general bulletin covering the full line of meters and control instruments made by this company.

Bernitz Furnace Appliance Co., 177 State St., Boston, Mass.—Bulletin B2. A folder on Bernitz clinker-proof refractories for boiler furnace walls.

Cutler-Hammer Mfg. Co., Milwaukee, Wis.—Leaflet entitled "Two Feet of Electrical Heat," dealing with Cutler-Hammer space heaters.

Morse Dry Dock & Repair Co., 17 Battery Place, New York.—A new and well-illustrated catalog of the Morse mechanical fuel oil burner and fuel oil-burning system.

Monitor Controller Co., Baltimore, Md.—Bulletin 67. A bulletin describing the Edgewound Resistor, an electrical resistor for use with motor starters, speed controllers and similar services, of moisture-proof and acid-resisting construction.

Charles Engelhard, Inc., 30 Church St., New York.—Bulletin 34-S. A folder describing the new Type "S" recorder for all sorts of temperature recording.

Bernitz Furnace Appliance Co., 177 State Street, Boston, Mass.—A general catalog of Bernitz refractories for clinker-proof, long life furnace walls.

Reading Steel Casting Co., Inc., Bridgeport, Conn.—No. 7. A new catalog of extra heavy cast steel valves.

The Berndorf Metal Works, Arthur Krupp A. G., Berndorf, Lower Austria. Leaflets 1, 2, 3, 4. Four pamphlets describing the pure nickel products made by this company and their use in the chemical engineering industries.

Lakewood Engineering Co., Cleveland, Ohio.—A booklet entitled "Snap Shots of Sensible Savings," describing economies made through the use of electric storage battery industrial trucks of the high lift type.

Celite Products Co., 53 West Jackson Blvd., Chicago, Ill.—Bulletin B-20B. A bulletin entitled "Insulation in the Rock Products Industries," describing the method of installing Sil-O-Cel rotary kiln insulating brick on lime and cement rotary kilns, and the use of insulation on shaft lime kilns, in making sandlime brick and in calcining gypsum.

York Mfg. Co., York, Pa.—Bulletin 74. A valuable bulletin giving the results of operating ammonia compressors under single and double stage conditions.

Reading Steel Castings Co., Inc., Bridgeport, Conn.—No. 8. A new catalog of 400-lb. W.S.P. cast-steel valves.

National Automatic Grease Cup Co., 1603 Michigan Ave., Chicago, Ill.—A folder describing an automatic grease cup for use with high-pressure lubricating systems.

The Walter E. Lummus Co., Boston, Mass.—A booklet entitled "Motor Fuel From Molasses," being a complete description of the Lummus method and equipment for the manufacture of alcohol-ether motor fuels.

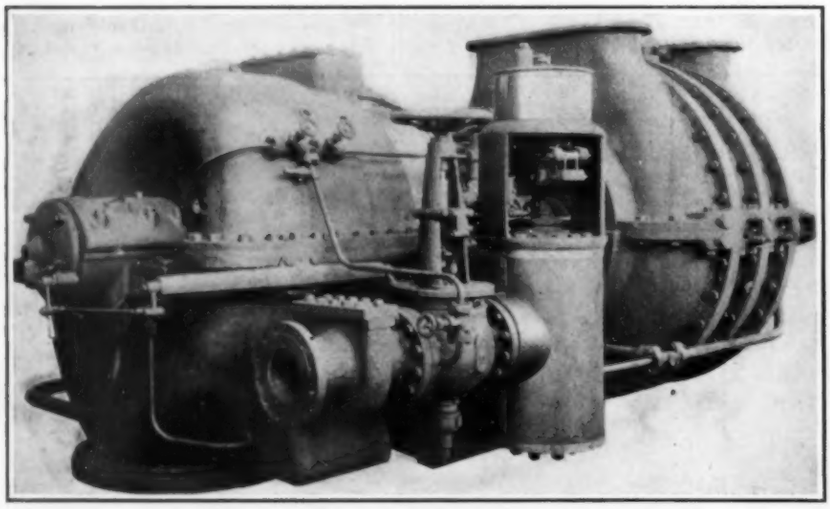


*Fig. 2—Centrifugal Compressor Rated WM-637-10,000-17-3,650, Driven by Three-Stage Extraction Type Curtis Steam Turbine*

Among the advantages claimed for this new type of compressor are higher efficiencies, simpler and stronger construction and minimizing of mechanical difficulties. A larger cooling capacity is expected to bring about greater efficiency, the conversion passages have been improved and the interstage passages simplified.

# U. S. Patents Issued Jan. 20, 1925

Machine for Kneading Plastic Material. Fernley H. Banbury, Ansonia, Conn., assignor to the Birmingham Iron Foundry, Derby, Conn.—1,523,387.

Tanning Compounds Obtained From Resins. John Breedis and Edward Crede, Philadelphia, Pa., assignors to Rohm & Haas Co.—1,523,390.

Combustion Control for Gas Producers. George H. Gibson, Montclair, N. J.—1,523,414.

Manufacture of Zinc Oxide. Harry A. Grine, Langeloth, Pa.—1,523,416.

Process and Apparatus for Producing Metal Oxides. Harry A. Grine, Langeloth, Pa.—1,523,417.

Operating Valve for Hydraulic Presses. Thomas B. Jones, Toronto, Ont., Can.—1,523,425.

Crushing and Separating Plant. Alexander Grant McGregor, Warren, Ariz.—1,523,435.

Method and Apparatus for Pressing Laminated Material. Frank J. MacDonald, Akron, O., assignor to the B. F. Goodrich Co., New York, N. Y.—1,523,440.

Condensation Product and Process of Making the Same. Leslie T. Sutherland, Yonkers, N. Y., assignor to Carboloid Products Corp., Newark, N. J.—1,523,459.

Machine for the Removal of Fat From the Small Intestines of the Cow. Pierre Villemer, Paris, France, assignor to Société Anonyme Fabre & Cie., Aubervilliers, France.—1,523,465.

Cellulose Article and Method of Making the Same. John Feith, Denver, Colo., and John W. Ziegler, Kokomo, Ind., assignors to James Clarence Patten, Kokomo, Ind.—1,523,476.

Discharge-Valve Arrangement for Transportation Tanks. Charles A. Lindstrom, Pittsburgh, Pa.; the Union Trust Co. of Pittsburgh, executor of the estate of said Charles A. Lindstrom, deceased.—1,523,484.

Combined Brick Kiln and Drier. Nicholas U. Ludwig, Buffalo, N. Y., assignor of one-third to George W. Weyand, Buffalo, N. Y.—1,523,485.

Apparatus for Fractionation. Herschel G. Smith, Swarthmore, Pa., assignor to the Atlantic Refining Co., Philadelphia, Pa.—1,523,497.

Drier. William G. R. Braemer, Cranston, R. I., assignor to General Fire Extinguisher Co.—1,523,509.

Core or Filler of Fusible Material for Hollow Vulcanizable Articles. Willis A. Gibbons, Little Neck, N. Y., assignor to the Hartford Rubber Works Co., Hartford, Conn.—1,523,519.

Gasoline-Filtering Compound. Thomas Le Vora, Iowa City, Iowa.—1,523,547.

Photochemical Process. Walter O. Snelling, Allentown, Pa.—1,523,563.

Extraction of Soluble Products From Wood. Vladimir Bredlik and Louis C. Whiton, Jr., New York, N. Y.—1,523,578.

Solidified Fuel. Robert Calvert, Lompoc, Calif., assignor to the Celite Co., Los Angeles, Calif.—1,523,580.

Leather Rolling, Glazing or Brushing Machine. Adolf Hintenach, Newark, N. J.—1,523,592.

Non-Conducting Substance. Charles E. Linebarger, Chicago, Ill.—1,523,600.

Gas Cleaner. Herbert C. Ryding, Birmingham, Ala.—1,523,611.

Grinder and Shredder. Harry J. Shelton, St. Louis, Mo.—1,523,614.

Process of Producing Joint-Making Packing. Franz Andrasek and Josef Frechsler, Zilina, Czechoslovakia.—1,523,624.

Minute Disintegration of Substances. Frederick John Edwin China, Esher, England.—1,523,632.

Seasoning Mixer for Leather-Finishing Machines. John W. Herkel, Middleville, and James D. McCoy, Little Falls, N. Y.—1,523,644.

Galvanizing Furnace. Wallace G. Imhoff, Pittsburgh, Pa., assignor to Warren S. Smith, New York, N. Y.—1,523,647.

Enameling Oven. Arthur Maehler, Chicago, Ill.—1,523,655.

Setting for Stills and for Similar Purposes.—1,523,657.

Method and Apparatus for Vulcanizing Continuous-Strip Materials. Gilbert L. Mathias, Cuyahoga Falls, O., assignor to the B. F. Goodrich Co., New York, N. Y.—1,523,658.

Grinding or Crushing Mill. John Rowland Torrance, Bitton, England.—1,523,674.

Cheese-Treating Apparatus. John H. Wheeler, Plymouth, and Henry Murray Scott, Waldo, Wis.—1,523,678.

Multiple-Retort Ore and Oil-Shale Roasting Furnace. Aron M. Beam, Denver, Colo., assignor to the American Continuous Retort Co., Denver, Colo.—1,523,682.

Method of Rust Removal and Prevention. William Yonkman, Chicago, Ill., assignor to Western Electric Co., Inc., New York, N. Y.—1,523,741.

Process for the Manufacture of a Cellulose Compound Indifferent to Substantive Colors. Herbert Zimmermann, Tubach, Switzerland, assignor to Firm of Texilwerk Horn A.-G., Horn-am-Bodensee, Switzerland.—1,523,742.

Production of Vulcanized-Rubber Products. Harry O. Chute, New York, N. Y.—1,523,755.

Gas and Oil Separator. Ford W. Harris, Los Angeles, Calif.—1,523,773.

Method of Removing Lead From Nickel. Noak Victor Hybinette, Wilmington, Del., assignor to National Trust Co., Ltd., Toronto, Canada.—1,523,779.

Process of Restoring Used Decolorizing and Clarifying Agents. Raymond K. Cole, Brunswick, Ga., assignor to Hercules Powder Co., Wilmington, Del.—1,523,802.

Process of Working Nitric-Acid Solutions Containing Alumina and Alkalis. Birger Fjeld Halvorsen and Oystein Ravner, Christiania, Norway, assignors to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Christiania, Norway.—1,523,807.

***These patents have been selected from the latest available issue of the "Official Gazette" of the United States Patent Office because they appear to have pertinent interest for "Chem. & Met." readers.***

***Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.***

Fireproof Fabric and the Process of Making Same. William G. Lindsay, Newark, N. J., assignor to the Celluloid Co.—1,523,813 and 1,523,814.

Process and Apparatus for Concentrating Fluids. John McGavack, Elmhurst, N. Y., assignor to General Rubber Co., New York, N. Y.—1,523,821.

Steam Joint. Charles H. Marret, Louisville, Ky., assignor to Louisville Drying Machinery Co., Inc., Louisville, Ky.—1,523,822.

Machine for Making Molded Shapes From Refractory Material. Charles L. Norton, Boston, Mass., assignor to Refractories Machinery Mfg. Co., Pittsburgh, Pa.—1,523,830.

Tooth Paste. Mortiz Schlesinger, New York, N. Y.—1,523,840.

Machine for Preparing Food Compounds. William A. Smith, Clarkson, N. Y.—1,523,843.

Recovery of Hydrogen Sulphide. Frederick W. Sperr, Jr., Pittsburgh, Pa., assignor to the Koppers Co., Pittsburgh, Pa.—1,523,845.

Manufacture of Bleach. Charles F. Vaughn and William B. Leach, Jr., Niagara Falls, N. Y., assignors to the Mathieson Alkali Works, Inc., New York, N. Y.—1,523,847.

Apparatus for Treating Fluids Under Pressure With Chemicals. Otto Best, San Francisco, Calif.—1,523,856.

Automatic Shower Catcher for Paper Machines. George W. Davison and Leslie John Martin, Glens Falls, N. Y.—1,523,868.

Recovery of Hydrogen Sulphide. Ralph E. Hall, Pittsburgh, Pa., assignor to the Koppers Co., Pittsburgh, Pa.—1,523,872.

Pulverizing Apparatus. Otto A. Kreutzberg, Lake Bluff, Ill., assignor to Blanton-Kreutzberg Co., Chicago, Ill.—1,523,881.

Dough-Conditioning Machine. Frank X. Lauterbur, Sidney, O.—1,523,883.

Apparatus for Separating Liquids From Gases or for the Drying of Air and Gases, Particularly Applicable as a Steam Drier. Albert Edward Tompkins, Brockenburst, England.—1,523,916.

Method of Preserving Wood. Walter R. Wheaton, Appleton, Wis.—1,523,925.

Method of Making Emulsions. Judson A. DeCew, New York, N. Y., assignor to Process Engineers, Inc., New York, N. Y.—1,523,933.

Machine for Molding Plastic Material. Philip S. Easterday, Portland, Ore., assignor to Tuerck MacKenzie Co.—1,523,936.

Treatment and Production of Hydrocarbons. George Frederick Forwood, London, England, assignor to United Kingdom Oil Co., Ltd., London, England.—1,523,942.

Treatment of Antimonial Metals. Frank F. Colcord, New York, N. Y., assignor to United States Smelting, Refining & Mining Co., Portland, Me.—1,523,980.

Tanning. Henry Hicks Hurt, Yonkers, N. Y., assignor to Robeson Process Co., New York, N. Y.—1,523,982.

Veneer Drier. Arthur J. Vance, Painesville, O., assignor to the Coe Mfg. Co., Painesville, O.—1,523,988.

Furnace. Richard Ziesing, Cleveland, O.—1,523,990.

**Issued Jan. 13**

Method for Making a Neutral Soap. Johanna Kirchfeld, Munich, Germany.—1,523,074.

Process and Apparatus for Treating Oil. Thomas M. Melott, Shawnee, Okla.—1,523,077.

Liquid-Level Gage. Michael Birt Field, Glasgow, Scotland, assignor to Pneumercator Co., New York City.—1,523,110.

Process and Apparatus for Mixing and Feeding Chemicals for Water Treatment. Walter H. Green, Chicago, Ill., assignor to International Filter Co., Chicago, Ill.—1,523,118.

Feed Valve for Plastic Materials. Richard Hellmann, Long Island City, N. Y.—1,523,122.

Method and Apparatus for Making Glass. Walter O. Ambler, Pittsburgh, Pa.—1,523,157.

Vitrified Product and Process of Making Same. Arille De Gallaix, Pittsburgh, Pa.—1,523,179.

Dry Satin White and Process of Making Same. Henry V. Dunham, Mount Vernon, N. Y.—1,523,182.

Mixing Machine. Ernst Eger, Detroit, Mich., assignor to Morgan & Wright, Detroit, Mich.—1,523,184.

Method of Treating Oil. Walter H. Kaul, Mexia, Tex.—1,523,219.

Method of and Reagent for Dehydrating Oils. Walter H. Kaul, West Columbia, Tex.—1,523,220.

Apparatus for Extracting Sugar From Raw Materials. Andre Olier, Clermont-Ferrand, France, assignor to Société Anonyme des Etablissements A. Olier, Clermont-Ferrand, Puy-de-Dome, France.—1,523,277.

Insecticide and Process of Producing the Same. Henry L. Ranard, Philadelphia, Pa.—1,523,289.

Manufacture of Condensation Products of the Anthraquinone Series. Ewald Steinbuch, Basel, and Franz Ackermann, Binningen, near Basel, Switzerland, assignors to Society of Chemical Industry in Basle, Basel, Switzerland.—1,523,308.

Manufacture of Natural-Gas Gasoline. Harold E. Thompson, Clendenin, W. Va., assignor to Carbide & Carbon Chemicals Corp.—1,523,313 and 1,523,314.

Method of Manufacturing Fulminate of Mercury. Edward A. Barnes, Oakland, Calif., assignor to California Cap Co., Oakland, Calif.—1,523,338.

Reaction Product of Phenols and Sulphur Useful as Mordants and Process of Making Same. Martin Battegay, Mulhouse, France.—1,523,340.

Process of Producing Light-Colored Tanned Leather. Oscar Low Beer, Frankfort-on-the-Main, Germany.—1,523,365.

## New Publications

"Bentonite," by *Hugh S. Spence.* Publication 626, Department of Mines, Ottawa, Canada.

***Western Electric Co.***

"Vacuum Tube Oscillators," by *J. W. Horton.* Reprint B-88-1.

"Magnetic Measurements on Materials of High Initial Permeability," by *P. P. Cioffi.* Reprint B-84-1.

"Crack Development in Glass Under Electrical Stress," by *Earle E. Schumacher.* Reprint B-85-1.

***Imperial Mineral Resources Bureau***

"Statistics, 1920-1922, on Lead." Price 2s. 6d.

"Statistics, 1920-1922, on Zinc." Price 3s. Can be obtained from H. M. Stationery Office, Kingsway, London, W. C. 2, England.

# News of the Industry

## Summary of the Week

Department of Commerce is considering the establishment of an advisory committee composed of men in the chemical industry.

Cramton prohibition bureau bill, as amended by subcommittee, is expected to be reported favorably by Senate Judiciary Committee.

Reports from abroad state that the German dye industry is in unsatisfactory position and plans are in progress for reorganization of the cartel.

Official figures state that exports of chemicals in 1924 declined $11,000,000 from the total for 1923.

Domestic producers of oils protest ruling which excludes agricultural costs of oil-bearing materials from report of tariff investigation.

Conference committee on Muscle Shoals bill appointed and Underwood bill likely to pass at this session.

Decisions made on many important matters at assembly of American Engineering Council.

### German Dye Industry Loses Hold on World Markets

Germany's grip on world dye markets has loosened perceptibly since the introduction of the rentenmark. Costs of production in Germany are mounting. It is apparent that wages must continue to increase for some time to come before they reach a level that will be reasonably equitable.

The Interessen Gemeinschaft is known to have lost half of its pre-war foreign business and admits that no profits are accruing from the present volume of its business. The loss of markets to American manufacturers is explained by saying that they are selling at a loss. The I. G. contends that these losses are easily absorbed because of the profits possible in the highly protected domestic market in the United States.

German stocks of dyes are said to be large. Capital is too scarce to permit of the sale of any of these reserves at a loss, particularly when these stocks would have to be replaced at higher costs. The feeling is that the very existence of these stocks gives them some control over the market. The hope of the German dye makers is that manufacturers in other countries will raise prices, or that they may be able to negotiate sufficient foreign loans to enable them to sell at a loss in certain markets until competition is driven out. American dye manufacturers are hoping that if our bankers make loans to the German dye industry they will insist upon having a representative on the directing body so that they may be certain that American money is not used in the furthering of unfair trade practices.

The Cartel is in the process of reorganization along the lines of the U. S. Steel Corporation. Determined steps are being planned looking to the ultimate recovery of foreign markets. Hope still is entertained than an arrangement can be made with the British which will make it easier to compete with the Americans. Another expedient being considered is the operation of plants in Norway, where cheap water power, near the seaboard, is available. Also in case of another war such plants would be in a country likely to remain neutral. So as not to be caught, as during the World War, consideration also is being given the erection of dye plants in China and Spain.

If it should develop that American dyes cannot be driven out of foreign markets, the Germans then are planning to attempt to induce American manufacturers, as a whole, to agree to a division of world markets, much the same as has been done by the Sulphur Export Association and the Italian producers. If that plan, in turn, should fail, the final alternative, under consideration would be the establishment of plants in the United States.

### Vegetable Oil Producers Protest Against Tariff Ruling

A protest against the ruling of the Tariff Commission, under which its investigators are not reporting on the agricultural cost of the materials used in the manufacture of vegetable oil products, was issued at a meeting in Washington January 27 of producers of fats and oils. The statement calls attention to the fact that the vegetable oil tariff case probably will come to trial within 60 days.

During the past year, the domestic producers declare, 542,000,000 lb. of oils and oil-bearing materials came into the United States entirely free of duty. In addition, 222,665,376 lb. of coconut oil came in duty free from the Philippines.

### Underwood Muscle Shoals Bill Believed Certain of Passage

After acrimonious debate the Senate on Jan. 28 designated Senator Keyes of New Hampshire, Senator McKinley of Illinois and Senator Kendrick of Wyoming as its conferees on the Muscle Shoals bill. The House of Representatives previously had selected as its members of the conference Representative McKenzie of Illinois, Representative Morin of Pennsylvania and Representative Quinn of Mississippi.

The effort in the Senate to depart from custom and select as conferees members known to be in sympathy with the legislation passed by the Senate failed by a vote of 35 to 33. This would have resulted in the selection of Senators Norris, McNary and Smith, all of whom opposed the Underwood bill. Having won his point, however, Senator Norris declined to serve on the conference committee. Senators McNary and Smith likewise declined. Other members of the Committee on Agriculture were named in the order of their rank. A number of those designated declined to serve, but finally the three Senators mentioned were prevailed upon to accept the responsibility of reaching an agreement with the conferees of the House as to the final form of the report on the Muscle Shoals legislation.

While there was a demand in the House for a more drastic fertilizer provision, it is believed the conferees will modify the Underwood bill so as to increase the probability of securing bidders for the government's Muscle Shoals properties.

The action of the Senate practically insures the passage of the Underwood bill at this session of Congress and will make it possible to provide for the utilization of the power to be developed at the Wilson Dam immediately that it becomes available.

## Symposium on Corrosion at Baltimore

At the Baltimore meeting of the American Chemical Society a day and a half symposium on corrosion has been planned. The list of authors includes a large proportion of the best writers on corrosion, both in this country and in Europe. In addition to papers by these well-known students of corrosion there are several interesting ones by men who have given intensive study to particular problems. The theoretical considerations which will be covered include a full discussion of the present state of the theory as it has been worked out by the collaboration of representative Americans; also, the applications and advances along special lines which have recently been made in Europe. It includes both theory and data on the effect of oxygen in corrosion, which will bring into the discussion the recent advances in knowledge of this subject. There are also data on corrosion in the absence of oxygen, and corrosion by other important corroding agents. The newer electrolytic theory of corrosion, which has been developed during the last few years, will be thoroughly discussed. Papers will be given by men who have been instrumental along this line. The subject matter will include such general fields as the corrosion of brasses; corrosion of iron; corrosion of aluminum alloys; corrosion of stainless steels; the effect of minute films on corrosion; corrosion of alloys at high temperatures; corrosion of antique bronzes. The program contains such names as Dr. W. R. Whitney, Dr. W. D. Bancroft, W. H. Bassett, Dr. Guy D. Bengough and Dr. Ulick R. Evans. Completed papers designed for presentation before the Division of Industrial and Engineering Chemistry must be submitted for review by March 1.

## Chemical Exports Declined in December

Imports of chemicals during December continued in practically the same volume as the November movement. The value of chemicals on the free list brought in during December aggregated $7,093,019. Dutiable chemicals imported were valued at $3,242,823.

With the returns from the various customs districts for December the totals for the 12 months were completed. These show that $89,312,715 worth of free list chemicals were brought into the country during 1924. The value of dutiable chemicals imported was $32,361,330.

The December total of coal-tar chemicals imported was $1,559,590. This is a decline of nearly half a million dollars as compared with the November total. The imports of coal-tar chemicals for the 12-month period were valued at $20,119,024.

During December colors, dyes and stains to the extent of 416,256 lb. were imported. This item shows a marked upturn both as compared with December, 1923, and with November of 1924. Imports of fertilizers increased slightly, the December figure being 204,561 tons. An increase in similar proportion characterized the inbound movement of paints, pigments and varnishes. Imports of creosote oil slumped from the high figure of November, but still range well above the rate of importation of December, 1923. Imports of white arsenic continued to fall. Imports of glycerine during December amounted to 2,576,802 lb., continuing the heavy imports of November. Some detailed comparative figures are as follows:

| | December 1923 | December 1924 |
|---|---|---|
| White arsenic, lb. | 2,814,018 | 652,341 |
| Citric acid, lb. | 44,800 | 56,000 |
| Formic acid, lb. | 140,901 | 174,237 |
| Oxalic acid, lb. | 228,441 | 492,245 |
| Tartaric acid, lb. | 297,584 | 268,800 |
| Copper sulphate, lb. | | 182,937 |
| Carbonate potassium, lb. | 917,979 | 759,237 |
| Hydroxide potassium, lb. | 1,866,209 | 1,148,577 |
| Chlorate potassium, lb. | | 676,831 |
| Cyanide sodium, lb. | 2,850,714 | 2,287,524 |
| Ferrocyanide sodium, lb. | 98,218 | 173,139 |
| Nitrite sodium, lb. | 82,933 | 270,651 |
| Naphthalene, lb. | 1,927,614 | 315,241 |
| Creosote oil, gal. | 4,589,311 | 6,897,321 |

Exports of chemicals during December were valued at $8,455,461. This brought the total for the year to $111,516,566. December exports were slightly less than those in December, 1923. The 12 months figures show a decline in exports for the year of $11,000,000.

Exports in the soda group continued during December at about the monthly average, the aggregate of exports being 28,047,180 lb. Exports of paints, pigments and varnishes increased slightly to $1,300,800. Exports of fertilizer and fertilizer materials turned upward sharply, the movement in December having been 91,371 tons. Movement of explosives also turned upward. December exports were 1,518,396 tons. Detailed figures covering certain commodities with comparative figures for December, 1923, are as follows:

| | December 1923 | December 1924 |
|---|---|---|
| Benzol, lb. | 9,143,958 | 7,914 |
| Sulphuric acid, lb. | 359,665 | 948,326 |
| Acetate of lime, lb. | 1,347,667 | 980,145 |
| Bleaching powder, lb. | 1,455,386 | 1,690,223 |
| Chlorate of potash, lb. | 16,450 | 13,377 |
| Bichromate of potash, lb. | 220,899 | 70,257 |
| Soda cyanide, lb. | 16,256 | 189,269 |
| Soda ash, lb. | 1,186,255 | 1,626,516 |
| Caustic soda, lb. | 9,631,927 | 8,619,679 |
| Sulphate of ammonia, tons | 11,653 | 6,166 |

The figures used in the foregoing are those furnished by the Department of Commerce.

## Engineering Council Makes Important Decisions

Changes in the government reorganization bill as it affects the Department of the Interior were sanctioned by the assembly of the American Engineering Council in Washington, Jan. 16. After a long discussion, it was decided to join with other national bodies in seeking amendments to the existing bills in House and Senate, $1,000 being voted toward a fund of $5,000 for this purpose.

Adopting the report of its committee on government reorganization as it relates to engineering matters, the Council in a formal resolution declared that the proposed legislation should be amended so as to bring it into substantial accord with the principles embodied in the Jones-Reavis bill originally sponsored by the engineering profession through the National Public Works Department Association.

The administrative board declared its opposition to the bill sponsored by Senator Ransdell authorizing the Federal Power Commission "to prepare a comprehensive plan of development of the water resources of the United States for the purpose of providing electric power for farms, rural communities, cities and industries, of promoting navigation, of controlling floods, and of securing other beneficial public use of such resources." The board adopted the report of the public affairs committee, headed by Calvert Townley of New York, urging defeat of the measure.

To the American Institute of Chemical Engineers the Council referred a proposal to support the Senate bill appropriating $550,000 to be expended jointly by the United States Geological Survey and the Department of Agriculture to determine the location and extent of potash deposits in the United States.

These two vice-presidents were elected: A. W. Berresford of Niagara Falls, N. Y., representing the American Institute of Electrical Engineers; Dean Dexter S. Kimball of Cornell University, designated by the American Society of Mechanical Engineers. Harrison E. Howe of Washington, D. C., was re-elected treasurer, and Lawrence W. Wallace was again chosen executive secretary. The next meeting of the Council will be held in Philadelphia in May.

The Engineers Club of Little Rock, Arkansas, was admitted to membership. Other local societies, it was said, are likely to be enrolled in the Council during 1925.

## Favorable Report Expected for Amended Cramton Bill

While no action has been taken by the Senate Judiciary Committee toward reporting the Cramton prohibition bureau bill to the Senate up to the time this was written, it appears assured that the majority of the committee will recommend passage of the measure with the amendments suggested by the subcommittee. Senator Reed of Missouri is expected to file a minority report.

The subcommittee which held hearings on the bill, which would make the present Prohibition Unit of the Bureau of Internal Revenue an independent bureau of the Treasury Department, made a divided report to the full committee, the majority favoring recommendation for passage with amendments designed to meet the objections of consumers of industrial alcohol and druggists by creating a board of review of three members to which appeals from the commissioner's rulings might be carried and by providing for a Division of Permits as well as a Division of Chemistry and Alcohol with jurisdiction over industrial alcohol. Senator Reed of Missouri dissented from the majority of the subcommittee, urging drastic amendments having to do largely with the administration of the law respecting beverage alcohol.

# Washington News

## Advisory Committee Considered for Department of Commerce

For some weeks the Chemical Division of the Department of Commerce has been considering the setting up of an advisory committee. It was the earnest desire of the division and of the department that publicity be withheld until the plan had assumed some definiteness. The desires of the department in that respect were disregarded by one publication under circumstances that have provoked no little resentment.

The plan has not crystallized even as yet, and the Chemical Division is authorizing no comment in that connection, but in view of the publicity which has been given the matter those who have had knowledge of the negotiations have been released from any obligation to refrain from discussing the matter on their own initiative.

The department's policy with regard to the commodity divisions is to confine their activities to lines of endeavor that have been suggested by the industry concerned. It is believed American business can be served better by allowing the suggestions as to what should be done to come from the outside rather than from the inside. Government specialists and technologists frequently are accused of being theoretical, rather than practical. It is to avoid just this that all of the commodity chiefs are seeking constantly to confine their important efforts to demands which have been shown to be widespread within the particular industry they happen to be serving.

In connection with this advisory committee the thought was to secure the services of a small committee of outstanding men in the chemical industry. No effort was to be made to have it representative of all branches of activities of a chemical character. It is hoped that men of vision, and, of almost equal importance, men who will contribute an adequate amount of time to the committee's work, can be induced to make this contribution to the public welfare.

## Garabed Bobs Up Again

The Garabed free-energy generator will not down. An effort was made in the House on Jan. 21 by Representative Begg of Ohio to secure the passage of a bill proposing, under certain conditions, to give Garabed T. K. Giragossian a patent for his generator. Under this bill he is to demonstrate his engine to four scientists appointed by the President, under the condition that if it is as he claims the patent is to be granted him.

Representative Begg admitted that the proposition "looks like a monstrosity, but I do not believe anything is impossible. It does not cost the United States a nickel and if he has what he claims it will be a benefaction to mankind." Representative Blanton called attention to the fact that a similar bill was passed during the last Congress, but that the inventor had failed to meet its provisions. He objected to the consideration of the bill and it was returned to the calendar.

## Decline in U. S. Export of Phosphate to France

During the first 11 months of 1924, France imported 1,189,078 metric tons of phosphate, as compared with 1,218,137 tons for the corresponding period of 1923, Trade Commissioner D. J. Reagan reports from Paris. Imports from the United States were only 9,524 tons during these 11 months of 1924, as compared with 30,029 tons during the similar period of 1923. There were no imports from the United States during November. Exports from France for these two periods were 3,593 tons and 3,820 tons respectively.

The following table gives the imports during the first 11 months of 1924,

| | 1924, Tons | 1923, Tons | 1922, Tons |
|---|---|---|---|
| Total | 1,189,076 | 1,218,134 | 1,066,842 |
| Tunis | 859,875 | 998,287 | 889,180 |
| Algeria | 223,225 | 156,132 | 128,235 |
| Morocco | 90,768 | 26,551 | 39,199 |
| United States | 9,524 | 30,029 | ..... |
| Belgium | 5,683 | 6,585 | 10,228 |
| Other countries | 1 | 580 | ..... |

## Increased Imports of Bromine Compounds Last Year

A review of the imports of bromine compounds entered for consumption in the United States shows that importations in 1923 were valued at $19,062 and increased considerably in the first 9 months of 1924, particularly the third quarter to $157,466, according to the Chemical Division of the Department of Commerce. The imports entered were classified as follows:

| | 1923 | | 1924 (First 9 Months) | |
|---|---|---|---|---|
| | Lb. | Dollars | Lb. | Dollars |
| Bromine | 782 | 1,171 | 25,811 | 6,089 |
| Bromine, compounds of, n.s.p.f. | 4,123 | 1,581 | 31,527 | 5,561 |
| Sodium bromide | 114,341 | 10,574 | 403,457 | 53,465 |
| Potassium bromide | 52,833 | 5,736 | 752,587 | 92,351 |

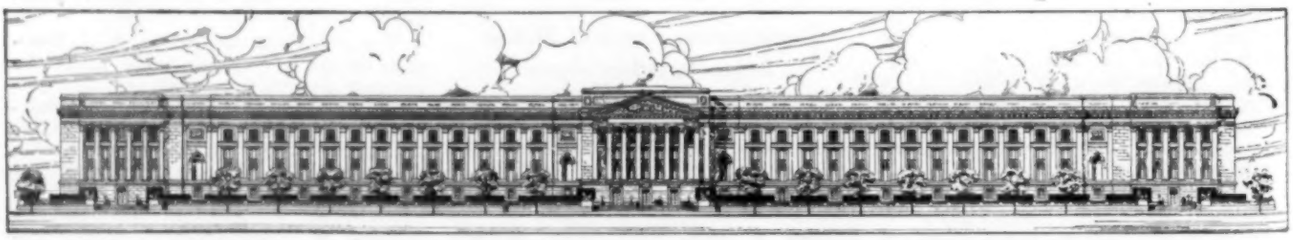
Increased importations are attributed to the demand for bromides required in the production of tetra-ethyl lead, used as an anti-knock compound in gasoline engines.

## Congressional Investigation of Power Companies Doubtful

In its consideration of the Norris resolution proposing an exhaustive probe of the entire business of power companies the Interstate Commerce Committee of the Senate has discovered that both the Department of Justice and the Federal Trade Commission for some time have been conducting investigations to satisfy themselves that there is no violation of law in the inter-relation and conduct of power companies. The committee has been told, it is believed, that each agency has ample authority to handle the case.

As this is written, the committee has not decided whether or not to launch a Congressional investigation in addition, but it is known that any such proposal will meet with strong opposition, both in the committee and on the floor of the Senate, on the ground that it would be a duplication of a federal activity and would be calculated to inject politics into a matter which should be handled in a strictly legal way.

The Senate has given the committee an additional 5 days in which to consider the resolution.



**A Classic Addition to Washington's Growing Group of Magnificent Public Buildings**

The $5,000,000 National Museum of Engineering and Industry, to be erected on the Smithsonian Institution grounds on the Mall as a companion building to the natural history museum and the gallery f the fine arts, the classic structures erected in harmony with the new plans of the Fine Arts Commission, designed to make Washington the world's most beautiful capital city. The new museum will house exhibits depicting the dramatic evolution of engineering and the industries and will be the first national institution in this country devoted exclusively to recording industrial progress. It will be 1,150 ft. long, 250 ft. deep and cover 27 acres of floor space. The great central rotunda will house a hall of fame for eminent engineers, inventors and industrialists and a founders' room to commemorate those who will have contributed to the museum, in time, money or effort. A public building and endowment fund of $10,000,000 is being raised from the present headquarters of the National Museum of Engineering and Industry in the Engineering Societies Building, 29 West 39th St., New York City.

# Large Gain in Output of Chemicals in 1923

### Census Figures Report an Increase of 61.3 Per Cent in Values as Compared With 1921

The Department of Commerce announces that, according to the data collected in the biennial census of manufacturers, 1923, the establishments engaged primarily in the manufacture of chemicals, other than sulphuric, nitric and mixed acids, explosives, fertilizers and wood-distillation products, reported a total output valued at $630,493,969, an increase of 61.3 per cent as compared with $390,768,434 in 1921, the last preceding census year, and of 9.8 per cent as compared with $574,141,030 in 1919. In addition, establishments whose principal products were sulphuric, nitric and mixed acids reported, for 1923, a combined output valued at $24,404,580, and subsidiary chemical products to the value of $37,596,338 were manufactured by establishments in other industries, making an aggregate of $692,494,887, comprising chemicals to the value of $675,797,974 and byproducts, residues and amounts received for contract work, $16,696,913.

The value of chemicals produced by the aid of electricity amounted in 1923 to $105,357,452, or 15.6 per cent of the total value of chemicals produced, and in 1921 to $57,979,720, or 13.1 per cent.

Of the 736 establishments reporting for 1923, 125 were located in New Jersey, 106 in New York, 83 in Pennsylvania, 60 in Ohio, 49 in California, 45 in Illinois, 36 in Massachusetts, 22 in Missouri, 21 in Michigan, 17 in Virginia, 16 in Indiana, 13 in Tennessee, 12 in Minnesota, 11 each in Maryland, West Virginia, and Wisconsin, and the remaining 98 in 25 other states. The statistics for 1923 and 1921 are presented in the accompanying tables. The figures for 1923 are preliminary and subject to such correction as may be found necessary upon further examination of the returns.

**Table I—General Statistics for the Chemical Industry, 1923 and 1921**

| | 1923 | 1921 | Per Cent of Increase |
|---|---|---|---|
| Number of establishments | 736 | 692 | 6.3 |
| Wage earners (average number)* | 74,864 | 46,306 | 61.8 |
| Maximum month | June 77,374 | Jan. 52,958 | |
| Minimum month | Dec. 73,942 | July 42,885 | |
| Per cent of maximum | 94.3 | 81.0 | |
| Wages | $99,785,204 | $58,023,943 | 72.0 |
| Cost of materials (including fuel and containers) | $316,711,260 | $190,502,119 | 66.3 |
| Products, total value | $630,493,969 | $390,768,434 | 61.3 |
| Value added by manufacture† | $313,782,709 | $200,266,315 | 56.6 |
| Horsepower | 867,387 | ‡ | |
| Coal consumed (tons of 2,000 lb.) | 4,955,962 | ‡ | |

* Not including salaried officers and employees nor proprietors and firm members. Statistics for these classes will be given in final report.
† Value of products less cost of materials.
‡ Not reported.

## To Celebrate Thirtieth Anniversary of Ceramic Education

Celebrations appropriate to the thirtieth anniversary of the beginning in America of collegiate ceramic education will mark the annual meeting of the American Ceramic Society, Feb. 16 to 21, at Ohio State University, Columbus, Ohio, where the first department of ceramics was established 30 years ago. At present ten universities have ceramic departments. All of these, as well as all national ceramic organizations, are participating actively in the ceremonies of the celebration.

Monday, Feb. 16, will be devoted almost entirely to the anniversary celebrations. In the morning, President W. O. Thompson, of Ohio State University, will make the address of welcome, following which Dr. Edward Orton, Jr., will speak on "The Founding of the First Ceramic School," A. V. Bleininger on "Thirty Years Progress in Ceramic Education and Dr. E. R. Weidlein on "The Future of Ceramic Education."

Papers in the afternoon will be "Value and Possibilities of Ceramic Education to the Craftsman," by Prof. Charles F. Binns; "The Early Stages of the Science of Ceramics in America," by Karl Langenbeck; presidential address, President R. D. Landrum.

In the evening there will be a reception to presidents and representatives of ceramic schools, followed by special entertainment.

Technical programs of the seven industrial divisions of the society will be presented on Tuesday and Wednesday. In addition to their general programs several of the divisions have developed timely symposia; Refactory Division, foundry repartory problems, and, with the Glass Division, a discussion of glass house refractories; Heavy Clay Products, preparation, drying, burning, plant design and operation; White Ware Division, casting problems.

**Table II—Value of Chemical Products, by Industries and by Groups, 1923 and 1921**

| Industry or Chemical Group | 1923 | 1921 | Per Cent of Increase* |
|---|---|---|---|
| Total | $692,494,887 | $454,373,920 | 52.4 |
| Industry: Chemicals | 630,493,969 | 390,768,434 | 61.3 |
| Industry: Sulphuric, nitric and mixed acids | 24,404,580 | 21,462,920 | 13.7 |
| Subsidiary chemical products from other industries | 37,596,338 | 42,142,566 | −10.8 |
| Chemical groups: | | | |
| Coal tar products | 142,029,652 | 75,918,521 | 87.1 |
| Sodium compounds | 108,916,329 | 83,698,199 | 30.1 |
| Plastics | 102,229,807 | 58,836,711 | 73.5 |
| Acids | 79,590,368 | 60,262,890 | 32.1 |
| Compressed and liquefied gases | 54,188,407 | 40,420,835 | 34.1 |
| Alums, aluminum, and compounds | 53,178,006 | 23,243,824 | 127.8 |
| Nitrogen and fixed-nitrogen compounds | 30,682,636 | 21,059,976 | 45.7 |
| Bleaching compounds | 15,671,953 | 13,900,353 | 12.7 |
| Potash and potassium compounds | 6,377,461 | 4,934,749 | 29.2 |
| All other chemicals: | | | |
| Inorganic | 84,543,146 | 63,568,998 | 33.1 |
| Organic | 75,914,191 | 44,661,100 | 70.0 |
| Group total, gross | $753,321,956 | $490,506,156 | 53.6 |
| Intergroup duplications† | 77,523,982 | 47,340,715 | .... |
| Total chemicals, net | $675,797,974 | $443,165,441 | 52.5 |
| Byproducts, residues and amount received for contract work | 16,696,913 | 11,208,479 | 49.0 |
| Chemicals produced by the aid of electricity, total (included above) | $105,357,452 | $57,979,720 | 81.7 |
| Metals and alloys: | | | |
| Ferroalloys | $18,604,062 | $8,835,356 | 110.6 |
| Rare metals and alloys | 3,035,302 | 1,289,430 | 135.4 |
| Other metals | 29,924,140 | 12,196,995 | 145.3 |
| Abrasives, aluminous and siliceous | 12,720,027 | 5,500,303 | 131.3 |
| Calcium carbide | 8,818,221 | 7,482,010 | 17.9 |
| Chlorine and hypochlorites | 8,660,802 | 7,808,853 | 10.9 |
| Sodium hydroxide | 7,033,969 | 6,049,505 | 16.3 |
| Oxygen | 4,746,928 | 1,791,926 | 164.9 |
| Hydrogen | 1,151,778 | 639,553 | 80.1 |
| All other | 10,662,223 | 6,385,789 | 67.0 |

* A minus sign (—) denotes a decrease.
† These duplications result from the inclusion of certain classes of products in more than one group; for example, nitric acid is included in both "Acids" and "Nitrogen and fixed-nitrogen compounds," and carbonic-acid gas is included in both "Acids" and "Compressed and liquefied gases."

## Du Pont Company Forms Its Own Chemical Engineering Society

In order to provide for a better interchange of technical information among its various plants and divisions, the du Pont company has recently organized the du Pont Chemical Engineering Society. Semi-monthly discussions of the basic principles of chemical engineering and their application in the various du Pont activities are planned.

The society is to have an advisory council consisting of W. F. Harrington, general manager of the dyestuffs division; A. D. Chambers, E. K. Bolton and E. G. Ackart. The chairman is G. M. Read and the secretary is R. N. Mulliken. The meetings are to alternate between Wilmington, the company's main office, and Pennsgrove, N. J., where the dyeworks are located.

## Increasing Interest in Research in Canada

An increasing interest in the work and service of scientific research is being shown by Canadian industries. Evidence of this was furnished at a meeting in Ottawa of the Honorary Advisory Council on Scientific and Industrial Research, when a number of applications were received from different industrial concerns for special researches. Committees were named by the Council to get these lines of study under way.

# Men You Should Know About

EDWARD E. ARMSTRONG, vice-president of the Pennsylvania Salt Co., Philadelphia, Pa., and superintendent of the Natrona plant of the company, has resigned. CHARLES M. BUTTERWORTH, also a vice-president of the company, has tendered his resignation.

Dr. J. C. BAKER of the Wallace & Tiernan Co. will speak at the monthly meeting of the Niagara Falls Section of the American Electrochemical Society, Feb. 10, on "Chlorine in Sewage Disposal.

WILDER D. BANCROFT spoke before the Franklin Institute, Philadelphia, Jan. 29, on "Metallic Luster."

AMOS BEATY, president of the Texas Co., New York, gave a talk on oil conservation before the members of the local Bond Club, at a luncheon, Jan. 16.

CHARLES BELKNAP, executive vice-president of the Merrimac Chemical Co., Boston, Mass., has been elected president of the Anderson Chemical Co., Wallington, N. J., a recently acquired interest. WILLIAM WARREN, assistant treasurer of the Merrimac company, has been elected treasurer of the Anderson company.

Dr. GALO W. BLANCO has left his position as chief research chemist for the Riordon Pulp Corporation, Ontario, to accept a position with the du Pont Fibresilk Co., Buffalo, in charge of research on viscose. Dr. Blanco was at one time connected with the Forest Products Laboratory.

JOHN A. CAMPBELL of Trenton, N. J., head of the Trenton Potteries Co., has been re-elected president of the Trenton Banking Co.

J. F. CLERC, of Escher, Wyss & Cie., Zurich, Switzerland, passed through San Francisco recently on his way to the Orient. He expects to spend some months in Japan and Java, making a study of paper manufacture from rice-industry byproducts.

Colonel AUSTEN COLGATE of Colgate & Co., Jersey City, N. J., soap manufacturers, is the donor of a fund of $400,000 for a new building at Colgate University.

F. T. CUTHBERT has been re-elected president of the Solar Refining Co., Lima, Ohio, oil refiner. F. G. BORGES has been elected a vice-president; N. D. KEYS, vice-president and treasurer, and HOWARD A. GRAHAM, secretary.

AMBROSE N. DIEHL, heretofore general superintendent of the Duquesne works of the Carnegie Steel Co., Pittsburgh, Pa., has been appointed vice-president of the company, in charge of operations in the Pittsburgh district; he is a graduate of the Pennsylvania State College and has been connected with the company since 1899. I. LAMONT HUGHES, heretofore general superintendent at the Youngstown, Ohio, works, has been elected vice-president, in charge of operations in the Youngstown and Valley districts. SAMUEL G. WORTON, assistant superintendent at the Duquesne works, has been appointed superintendent to succeed Mr. Diehl.

F. S. EARLE has been appointed sugar-cane technologist, Tropical Plant Research Foundation, with headquarters at Herradura, Cuba.

F. V. GLYNN has been elected assistant secretary of the United States Rubber Co., New York. He will also act as secretary to the chairman of the board of directors.

WALTER C. HEATH, president of the Whitehead & Hoag Co., Newark, N. J., manufacturer of celluloid and composition novelties, has been elected a member of the executive and finance committees of the Celluloid Co. of the same city, succeeding Stephen N. Olin, resigned.

WILLIAM A. HODGE, secretary and general manager of the Western Board & Paper Co., Kalamazoo, Mich., has been elected a director of the company.

LEWIS H. LAWTON of Trenton, N. J., secretary and general manager of the Bartley Crucible Co., has been elected a director of the Trenton Trust Co.

Dr. S. C. LIND, chief chemist, Bureau of Mines, Washington, D. C., gave an address before the members of the Delaware Section, American Chemical Society, at the Hotel du Pont, Wilmington, Jan. 21, on the subject of "Helium, Its History and Possibilities."

## Calendar

AMERICAN CERAMIC SOCIETY, annual meeting, Columbus, Ohio, Feb. 16 to 21.

AMERICAN CONCRETE INSTITUTE, annual meeting, Chicago, Ill., Feb. 24 to 27.

AMERICAN ELECTROCHEMICAL SOCIETY, Niagara Falls, April 23 to 25.

AMERICAN ELECTROCHEMICAL SOCIETY (in charge). Joint meeting with Society of Chemical Industry, Société de Chimie Industrielle and American Chemical Society, Chemists Club, New York, Feb. 6.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, annual meeting, New York City, Feb. 16 to 19.

AMERICAN PULP AND PAPER MILL SUPERINTENDENTS ASSOCIATION, Niagara Falls, N. Y., June 4 to 6.

AMERICAN SOCIETY FOR TESTING MATERIALS, annual meeting, Atlantic City, June 22 to 26.

AMERICAN WOOD PRESERVERS ASSOCIATION, annual meeting, Chicago, Ill., Feb. 3 to 5.

BRUSSELS INTERNATIONAL AND COMMERCIAL FAIR (sixth), Brussels, Belgium, March 25 to April 8.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES, New York, Sept. 28 to Oct. 3.

SOCIETY OF INDUSTRIAL ENGINEERS, national convention, Hotel Winton, Cleveland, Ohio, May 6 to 8.

SOUTHERN EXPOSITION, Grand Central Palace, New York, May 11 to 23.

TECHNICAL ASSOCIATION OF THE PULP & PAPER INDUSTRY, Waldorf-Astoria, New York, Feb. 3 to 5.

A. B. MACBETH, vice-president and general manager of the Midway Gas Co. and the Southern California Gas Co., Los Angeles, Calif., has been elected president of the Los Angeles Chamber of Mines and Oil for the ensuing year. He will succeed A. C. MCLAUGHLIN, of the Associated Oil Co., who has acted in such capacity for 2 years past. Mr. Macbeth was at one time engineer and superintendent for the Kansas City Gas Co., and was president of the Natural Gas Association of America during 1911.

CHARLES A. MAY, of Trenton, N. J., formerly head of Maddock Pottery, now known as the Scammel China Co., is seriously ill at his home. He retired from active business in the pottery industry some months ago.

EUGENE E. NICE, of Philadelphia, Pa., manufacturer of paint and varnish, celebrated his fiftieth anniversary in active business on Jan. 7. A dinner was given in his honor at a local restaurant.

BRADFORD NOYES, JR., is with the Taylor Instrument Companies, Rochester, N. Y.

G. G. OBERFELL has been appointed director of research for the Phillips Petroleum Co., Bartlesville, Okla. He has previously been connected with the Hope Engineering & Supply Co., and has been active in the invention of the charcoal process for increasing the recovery of gasoline from natural gas.

H. K. RAYMOND, vice-president of the B. F. Goodrich Co., Akron, Ohio, manufacturer of rubber products, in charge of production, has resigned; he will continue to remain on the board of directors. Mr. Raymond has been connected with the company for the past 30 years, at one time being department manager, and later superintendent. He was elected to the vice-presidency in 1918. B. G. WORK, president of the company, will assume charge of production at the factories.

HORATIO S. RUBENS, president of the U. S. Industrial Alcohol Co., New York, will make a trip to Cuba, to study conditions in that country, with particular reference to the situation in the sugar industry.

ALICE T. SHERMAN has been re-elected president of the Sherman Paper Co., Watertown, N. Y.

HARRY I. THAYER of Boston, Mass., an official of the Thayer-Foss Co., of that city, leather tanner, has left for Florida on a vacation trip.

CHARLES E. VOITLE, assistant secretary of the National Association of Manufacturers of Pressed and Blown Glassware, Pittsburgh, Pa., has returned to that city from a trip to California.

CHARLES B. WARREN, of Detroit, Mich., has resigned as president and from the directorate of the Michigan Sugar Co., Saginaw, Mich., following his nomination by President Coolidge to be Attorney-General of the United

States. He will be succeeded as president of the sugar company by WILLIAM H. WALLACE, of Saginaw, who has been acting executive of the organization for a number of months past.

At a meeting of the Western Glass and Pottery Association, Pittsburgh, Pa., Jan. 13, REUBEN HALEY, of Beaver, Pa., general factory manager of the United States Glass Co., was re-elected president; WATSON W. LONG, of the Kinney & Levan Co., Cleveland, Ohio, was re-elected secretary and treasurer.

## Obituary

JOHN A. BARBOUR, an official of the Barbour Welting Co., Campello, Mass., died at his home at Brookline, Mass., Jan. 9, aged 57 years. He was well known in the welting branch of the leather industry and was active in introducing special machinery developments for this line of manufacture.

ANDREW A. DUNHAM, manager of the Casein Manufacturing Co. of Bainbridge, N. Y., died Jan. 14. Mr. Dunham was 46 years of age and for the past score of years had devoted his energy to the development of casein products and was very largely responsible for its present success.

PERCY FROST, expert pottery decorator and chemical agent, identified with the pottery industry in the Trenton, N. J., and East Liverpool districts, died recently. He came to the United States from England in 1880 and had been identified with the ceramic industry for about 25 years, being employed in various executive capacities at the Homer Laughlin China Co. and the Knowles, Taylor & Knowles Co. For the past 10 years he had been East Liverpool district representative for the Hanovia Chemical Co. of Trenton, N. J.

FRANK G. HERMAN, chief engineer and general superintendent of the Sandusky Cement Co., Cleveland, Ohio, died recently at his home of typhoid fever. He was a graduate of Drexel Institute, Philadelphia, Pa.

EDWARD JETTER, president of the Toledo Mirror Works, Toledo, Ohio, died at the University Hospital, Ann Arbor, Mich., Jan. 12, aged 46 years. He had been prominent in the plate glass industry for a number of years.

HARRY R. KIMMEL, chief chemist of the Marion Steam Shovel Co., Marion, Ohio, died suddenly at Kalamazoo, Mich., on Jan. 19, at the age of 46 years. He was a graduate of the Case School of Applied Science, Cleveland, and prominent in Cleveland social and fraternal circles.

Dr. DANIEL C. MANGAN, of Brooklyn, N. Y., for the past 32 years professor of chemistry and physics at the Brooklyn College of Pharmacy, died at his home on Jan. 6, of lobar pneumonia, aged 59 years.

DANIEL G. REID, of New York, one of the organizers of the American Tin Plate Co., Pittsburgh, Pa., and the first president of the amalgamated organization, died at his home, Jan. 27, of pneumonia. He was born at Richmond, Ind., 1858, and became interested in the tin plate industry in 1891. He was one of the organizers and treasurer of the original American Tin Plate Co., and 7 years later brought about a consolidation of 278 tin plate mills in the United States under the American company name. He was also one of the organizers of the National Steel Co., later acquired by the United States Steel Corporation.

H. E. SMYTHE, president of the S. R. Smythe Co., Inc., Pittsburgh, Pa., consulting engineer and an expert in glass engineering, died at his home on Penn Ave., Pittsburgh, Jan. 9, aged 60 years. A few weeks ago he suffered a stroke of paralysis, and was improving when pneumonia developed. He was born at Dover, England, and was graduated from Oxford University. Mr. Smythe came to Pittsburgh in 1886, and associated himself with his brother, the late S. R. Smythe, in the glass and affiliated engineering fields.

## Trade Notes

A report from Wilmington, Del., states that Lazote, Inc., a corporation formed by E. I. du Pont de Nemours & Co., has purchased a plant site for the manufacture of synthetic ammonia at Clinchfield, Va.

The Greek Minister of National Economy has announced that bids will be accepted in Athens on February 25, for the sale of approximately 6,000 tons of Naxos emery. The emery will be sold in twelve separate lots of 500 tons each.

Plans looking to the establishment of a dye plant at Kingston, Ont., are thought to have fallen through, despite the fact that the municipality stood ready to subsidize the effort to the extent of providing tax exemptions and the necessary land.

George R. Ellis has resigned as sales manager of the specialty department of the Niagara Alkali Co. at Niagara Falls. The resignation is to take effect on March 1.

Agustin Edwards, formerly Chilean ambassador at London, Carlos Aldunate Solar, Chilean Minister of Foreign Affairs, and Alfred Houston, general representative of Guggenheim Brothers at Santiago, Chile, have been elected directors of Anglo-Chilean Consolidated Nitrate Corp., recently organized by Guggenheim Brothers.

The Certain-teed Products Corp., of New York and Philadelphia, is named in an unfair competition, complaint issued by the Federal Trade Commission. The complaint alleges that the acquisition by the respondent of the capital stock of Thomas Potter Sons & Co. and the physical assets of the Cook Linoleum Co. and the Standard Inlaid Manufacturing Co. tends to obstruct and suppress the sale and distribution throughout the United States of a substantially large portion of linoleum, oilcloths and kindred products.

## Financial

Report of Arlington Mills for year ended Nov. 30, shows total sales of $15,411,762 against $24,166,012 in preceding year. Surplus after charges was $803,792 compared with $1,834,162. After payment of $960,000 dividends there was a deficit of $156,208 against surplus of $874,163 in 1923.

The Atlas Powder Co. for year ended Dec. 31 reports net income of $1,609,949 after charges and federal taxes, equivalent after preferred dividends to $4.09 a share earned on 261,438 shares of no par common stock. This compares with $2,296,270 in 1923.

The Diamond Match Co. has declared regular quarterly dividend of 2 per cent payable Feb. 10.

The Will & Baumer Candle Co. has declared regular quarterly dividend of 25c. a share on the common stock.

The statement of Devoe & Raynolds, Inc., for 11 months ended Nov. 30, shows net profit of $797,313 after charges, federal taxes and depreciation, equivalent, after allowing for preferred dividends, to $16.10 a share earned on $4,000,000 common stock. This compares with $895,677 for the full year of 1923, or $17.82 a share on common. Date of fiscal year has been changed from Dec. 31 to Nov. 30.

The B. F. Goodrich Co. has declared two regular quarterly dividends of $1.75 a share on the preferred stock, payable April 1 and July 1, respectively.

### Potash Sales in Germany

A report from Essen states that sales of potash in Germany during December amounted to 847,000 doppelzentner of $K_2O$, bringing sales for the second half of 1924 up to 5,143,934 doppelzentner, thus almost making up for the extraordinarily small sales of the first half of the year (3,275,069 doppelzentner). Total sales for the year amounted to 8,419,000 doppelzentner, or 440,000 doppelzentner less than in 1923. It is to be supposed that these figures represent only a part of the actual employment of potash, as large stocks of potash from the years of inflation remained with the farmers, which have now probably been for the most part consumed.

### Germans Use Motion Pictures to Promote Sale of Nitrogen

Motion pictures are being used by the German Badische company to promote the use of nitrogen fertilization. Pictures of growing crops are taken at regular intervals comparing the growth of fertilized and unfertilized plants. In that connection emphasis is being placed on statements that German-produced synthetic nitrogen is more efficient than nitrogen from natural sources. It is claimed that it is necessary to use 30 per cent more nitrogen in the form of Chilean nitrate to accomplish the results obtainable from German fertilizers.

# Market Conditions

## Moderate Buying Sustains Values for Chemical Products

### Reduction in Surplus Stocks and Large Contract Placements Place Producers in Position of Advantage

THE weighted index number for chemicals was higher as a result of last week's trading. The number stood at 114.15 as compared with 113.39 for the preceding week. Price changes were not radical but practically all the important chemicals are in a firm position. Recent buying has brought surplus holdings to a low level and producers have sold a large part of their output on contract and this combination has tended to remove keen competitive selling. Many of the imported chemicals also are firmer at primary points and this reduces competition from that source.

Spot trading has not reached a stage where it may be called active but inquiries are more regular and the total tonnage movement is on an ascending scale. Heavy chemicals against contracts are moving in a satisfactory way which is indicative of the wider activities of consuming industries.

Wood distillation chemicals are slow to improve. Methanol has been only moderately active and stocks of acetate of lime are still too large to encourage much expansion in current production. Acetone is finding keen competition and present selling prices are too low to admit of reasonable profits. Arsenic is another chemical which offers an exception to the general rule as stocks are large and consumption has failed to keep pace with the increase in output.

Fertilizer chemicals are finding a ready outlet. Increased output of sulphate of ammonia has failed to relieve the stringency of supplies and large amounts of synthetic sulphate have been imported to fill consuming needs. Nitrate of soda also attracted attention and consumption promises to run considerably above that of last year. Sulphuric acid continues to hold a strong position and buyers no longer are able to regulate values.

#### Acids

Keen interest is shown in the market for oxalic acid. Buying has not been especially active as consumers covered ahead when prices began to strengthen. There is uncertainty, however, regarding the level at which prices will settle. Stocks of imported acid have given some competition to domestic acid but the higher duty which went into effect may affect competition from abroad in the future. Imports of oxalic acid in December were 492,245 lb. and unofficial reports state that January imports were large. Formic acid is offered freely and prices are quoted as easy. Shipment prices for tartaric acid are on a par with spot values and demand is increasing. Citric acid also is in better demand and inquiry has extended to future positions. Lactic acid has been firm for some time and with consumers increasing their demands the situation is favorable for continued strength in values. Sulphuric acid is expected to hold the improvement noted recently and the fertilizer trade, which offers the largest outlet, is taking quantities large enough to warrant belief in a greatly increased consumption of this acid during the current year.

**Acetone Declines 2c. Per Lb.—Bichromates in Firm Position—Imported Chloride of Barium Higher in Price—Arsenic Easy and Quiet—Oxalic Acid Steady — Mineral Acids in Good Demand — Salt Cake Moving Freely With Prices Firmer—Large Contract Deliveries of Caustic Soda**

#### Potashes

**Bichromate of Potash** — Inquiry for moderate sized lots has found sellers firm in their views and up to 8¾c. per lb. has been quoted. It is stated that 8¼c. per lb. can be done on large lots but this quotation is not free as some sellers are not willing to book orders at that figure. Chrome ore is holding unchanged at $21 per ton for Indian. Exports of bichromate of potash in December were 70,257 lb., making the total for the year 1,169,266 lb. as against 3,262,760 lb. in 1923.

**Carbonate of Potash**—Imports of carbonate of potash in December were 759,237 lb. Imports for the year were 6,277,813 lb. as against 10,949,977 lb. in 1923. Spot supplies of 80-85 per cent calcined carbonate are still small but offerings have been heard at 5¾@5¾c. per lb. Shipments are quoted at 5¾c. per lb. Calcined 96-98 per cent is held at 6¼c. per lb. on spot. Hydrated 80-85 per cent is firmer abroad and 5¾c. per lb. is an inside figure for spot and shipments.

**Caustic Potash**—Shipment prices have been well maintained at 7¼c. per lb. and this has kept spot values on an even basis with sellers holding out for 7¼c. per lb. Domestic grades are quoted at 7¼c. per lb. at works for round lots. Imports of caustic in December were 1,148,577 lb. and for the year, 12,657,186 lb. as compared with 10,857,354 lb. in 1923.

**Prussiate of Potash** — This material has not changed during the week. Buyers are not showing much interest in new supplies and lack of buying interest has prevented the maintenance of higher selling prices. Spot goods were quoted at 18c. per lb. but the quotation ranged upward according to seller with 18@19c. per lb. representing the difference in sellers' views.

#### Sodas

**Acetate of Soda**—Good buying has been a factor and some sellers are reported to be offering but sparingly. In most quarters the carlot quotation has been marked up to 5¼c. per lb. with smaller lots correspondingly higher.

**Bichromate of Soda**—Producers, who were active in booking contract orders at low prices in the latter part of last year, have been content to let prices take a natural course for the past month and values have been on an upward trend. Competition which was in evidence while large contracts were involved has been removed and the market presents a stable appearance. Spot material is quoted at 8½@9c. per lb. depending on quantity.

**Caustic Soda**—Main activity is found in the steady delivery against contracts and this involves a heavy tonnage. New business is reported as normal with only fair jobbing demand. Prices are steady with the contract price fixed at $3.10 per 100 lb. for solid 76 per cent in drums, carlots at works. Export demand is fair with prices still showing irregularity at $2.90@$3.05 per 100 lb., f.a.s. Exports in December were 8,619,679 lb. For the year exports were 92,115,631 lb. as compared with 114,683,728 lb. in 1923.

**Fluoride of Soda**—Imported material has been firmly held and the general asking price for spot goods was 9¼c. per lb. with many sellers holding out for 9½c. per lb. Supplies are not large and buying interest has increased. Domestic fluoride is in limited supply with prices nominal.

**Nitrite of Soda**—Imports of nitrite of soda in December amounted to 270,651 lb. This makes a total of 4,578,091 lb. for the year. In 1923 imports were 4,685,501 lb. Consumers are receiving domestic nitrite against contracts with quiet conditions prevailing in the spot market. Prices have not changed during the week and are on a basis of 9@9½c. per lb. for spot with contracts available at 8¾@8¾c. per lb.

### Miscellaneous Chemicals

**Acetate of Lime**—Exports of acetate of lime in December amounted to 980,145 lb. This makes a total of 23,166,759 lb. for the year as compared with 21,951,287 lb. in 1923. Fair demand is reported for this chemical at present with prices holding at $3 per 100 lb.

**Acetone** — Accumulations of stocks combined with relatively slow demand from consumers has brought out further weakness in this material. Producers of acetone by the fermentation process have been taking the initiative and they announced a decline of 2c. per lb., thus making the current quotation 10c. per lb., in tanks. Drums, in carlots are offered at 10½c. per lb. Smaller lots command the usual differentials.

**Arsenic**—The general quotation for domestic arsenic in large lots is 5¾c. per lb., but demand is not active and prices are none too steady with reports that 5½c. per lb. can be done on firm bids. The glass trade is said to be taking normal amounts of arsenic against contracts but insecticide makers are operating on a very restricted scale. Imported arsenic is not attracting attention and prices are largely nominal at 5½@6c. per lb. Imports of arsenic in December were 652,341 lb. and for the year reached a total of 17,703,996 lb. as compared with 21,149,545 lb. in 1923.

**Barium Chloride**—Recent arrivals of imported chloride have been small and the reduction of spot holdings combined with higher markets abroad has strengthened values in all positions. Spot quotations are $67@$68 per ton, and shipments are quoted at $66 per ton. Domestic chloride is held at $70 per ton and upward. Barium carbonate is quiet but spot material is holding around $57 per ton.

**Bleaching Powder** — The fact that some large consumers are not covered ahead accounts for a fair call for prompt delivery and reports indicate a better volume of trading in recent weeks. Prices are maintained on a steady basis with contracts quoted at $1.90 per 100 lb. for large drums, in carlots, at works. Prompt shipment from works is held at $2 per 100 lb. in carlots. Exports of bleach in December were 1,690,223 lb. This makes a total of 21,602,125 lb. for the year as compared with 28,828,428 lb. in 1923.

**Lead Acetate**—This material has been less affected by fluctuations of the metal than have the other lead salts. Demand has not been active and competition among sellers has maintained prices at former levels of 14½@15c. per lb. for brown broken, 14¾@15¼c. per lb. for white broken, and 15½@16c. per lb. for white crystals.

**Salt Cake**—Recent buying has been large enough to reduce holdings and values have strengthened. There has been a difference in price according to seller for some time and the increase in consumption has caused a withdrawal of the lower price levels with $17 per ton now established as an inside price. A range upward is quoted with the price depending on seller.

**Chem. & Met. Weighted Index of Chemical Prices**

Base = 100 for 1913-14

| | |
|---|---|
| This week | 114.15 |
| Last week | 113.39 |
| Feb., 1924 | 121.05 |
| Feb., 1923 | 125.59 |

Strength in mineral acids, bichromates, salt cake, barium products, and nitrate of soda brought about an advance of 0.76 in the weighted index number.

### Alcohol

Offerings of denatured alcohol were larger, but this did not bring out any change in the selling basis. In fact most traders still regarded the situation as firm, due to the high cost of basic materials and the steady expansion in business. Specially denatured alcohol was quoted at 54@55c. per gal., in drums, carload lots.

Trading in methanol was not satisfactory from the standpoint of volume and prices, while quotably unchanged, were more or less nominal. On the 97 per cent grade sellers quote from 72@74c. per gal., in drums, carload lots. Pure methanol, tank car basis, held at 74c. per gal., works.

Butanol was in good demand and leading producers appear to be well sold ahead. The market was firm at 27@28c. per lb.

# Coal-Tar Products

## No Further Price Changes in Crudes—Creosote Imports Larger—Phenol Offered Freely—Aniline Oil Steady

THE decline in the market for benzene, which occurred a week ago, brought out a little more buying interest on the part of consumers. Traders expect prices to hold steady pending further developments at producing centers. There has been no appreciable gain in the output since the first of the year and surplus stocks of benzene are not burdensome. Prevailing prices, according to distributors, should stimulate export business. There was a good call for toluene and the market was steady. Xylene was available in a fairly large way and prices were unsettled in some quarters. Naphthalene flake was irregular in price, but leading producers held to the schedule announced last fall. Scattered business took place in U.S.P. phenol for immediate delivery on the basis of 23c. per lb., large drums. Pyridine was firmer in sympathy with foreign markets. Official figures show that the movement of creosote oil into this country from abroad during December was heavy, amounting to 6,897,321 gal., which compares with 4,589,311 gal. in December a year ago. There was a fair inquiry for aniline oil at unchanged prices, notwithstanding the recent decline in benzene. Paranitraniline was quotably unchanged, with the undertone barely steady.

**Aniline Oil**—New business was described as fair in volume, and with deliveries against contract requirements somewhat larger, the undertone of the market ruled firm. Producers offered aniline oil for shipment from works on the basis of 16c. per lb., drums extra. There was little or no export inquiry. Prices for aniline oil for red were nominal around 40c. per lb. Aniline salt was available at 22@23c. per lb.

**Benzene** — Prices held on the basis of 21c. per gal. for the 90 per cent grade, in tank cars, f.o.b. works. The decline, announced a week ago, resulted in a moderate gain in the volume of business. Stocks are not large and the market is regarded as steady at the prevailing selling basis. Exports of benzene for the calendar year 1924 amounted to 57,882,171 lb., which compares with 111,336,768 lb. in 1923.

**Benzidine Base**—The market was unsettled and offerings appeared at prices ranging from 75@78c. per lb., in bbl.

**Creosote Oil**—Total importations of creosote or dead oil into the United States in the 12 months ended Dec. 31 amounted to 82,790,763 gal., which compares with 64,199,636 gal. in 1923 and 41,567,537 gal. in 1922. Manchester, England, reported a steady market with prices nominal at 6½@6¾d. per gal., loose, works, an advance of ¼d. for the week.

**Cresylic Acid**—Trading in cresylic was a routine affair only and no improvement was reported in the general situation. Competition continues keen and prices are rather easy in some directions. On the 97 per cent material the market settled at 59@63c. per gal., in drums, as to quantity and delivery.

**H-Acid**—While prominent factors in this intermediate held out for 70c. per lb., scattered lots could have been obtained at concessions. It was reported that 68c. could have been done.

**Naphthalene**—Demand was slow and prices barely steady. Refined flake was available at 5@5½c. per lb., depending upon the seller and quantity. Chipped material was nominal at 4½@4¾c. per lb. Crude, to import, was firmer, but quotably unchanged at 2@2¼c. per lb. Imports of naphthalene for the past year amounted to 5,230,708 lb., which compares with 21,036,458 lb. in 1923.

**Phenol**—There were sellers of U.S.P. phenol for immediate delivery at 23@24c. per lb., the inside figure obtaining on large drums. On futures the market was more or less nominal, leading interests quoting 23c., but intimating that better might be done on a firm bid.

**Pyridine**—Offerings on spot were not large and firm markets abroad caused prices to hold steady at the recent advance. The market settled at $4.15@$4.25 per gal. On nearby deliveries the inside figure could have been shaded.

**Toluene**—Distributors report a steady inquiry for toluene and prices held on an even basis, despite the decline in benzene. The call for toluene in the past month was sufficient to absorb production and spot stocks now are small.

# Vegetable Oils and Fats

## Lower Market for Cottonseed and Coconut Oils—Linseed Oil Sharply Higher—Tallow and Greases Decline

WITH the exception of linseed oil the tendency of prices for vegetable oils and animal fats was toward lower levels. The decline in crude and refined cottonseed oil, and coconut oil revived inquiry from consumers, but most of the bids were a shade under the prices quoted. There was a fair amount of buying in linseed oil just before the advance became general. Crude soya was in better demand. Soap makers were buyers of tallow and greases at lower levels. The weighted index number for oils and fats for the week declined 0.89.

**Cottonseed Oil**—The option market for refined cottonseed oil on the Produce Exchange was inactive and prices eased off a fraction of a cent on the decline in lard and reports of rather slow cash business in cottonseed oil products. Prime summer yellow oil for February closed on Thursday at 10.90c. bid and 11.25c. per lb. asked, with May at 11.26c. bid and 11.28c. per lb. asked. July P.S.Y. settled at 11.44c. bid and 11.45c. asked. The September option was traded in for the first time this year and sold at 11.65c. per lb. Refiners were buyers of March oil, but sold the more distant positions. Outside speculative interest was not an important factor in the course of the week's business. Crude oil sold at new lows for the movement and refiners were credited with taking on quite a little on the decline. In Texas crude sold at 8.90c. per lb., tank cars, f.o.b. mills, while in the Southeast most of the business placed went through at 9.12½c. per lb., same terms. Bleachable oil was offered at 9⅜@9¾c. per lb., tank cars, f.o.b. Texas common points. Cash trade in oil was disappointing, but traders feel that prices now are more in line with the ideas of consumers and that this should broaden trade. Export inquiry is expected to open up soon. Lard compound was unchanged at 13½c. per lb., carload lots. Pure lard in Chicago, May option, closed at 16.40c. per lb. The Department of Agriculture estimated the number of swine on farms and ranges as of Jan. 1 at 54,234,000, which compares with 66,130,000 on the corresponding date a year ago.

**Linseed Oil**—The feature in the market was the sharp advance in Argentine flaxseed, closing prices being 22c. per bu. higher than a week ago. The advance, according to private advices, was brought about by a change in sentiment on the part of speculative operators. The weather has been unsettled and new crop seed has not come forward in the volume expected. This has created a more widespread impression that the crop is small and the exportable surplus may not exceed 32,000,000 bu., which, if true, would lead to a shortage in the world's seed supply later in the season. American crushers have been more active on the buying end, but Europe has not yet entered the market on a large scale. The domestic seed markets moved into higher ground in sympathy with the Argentine and the advance in grains here. Duluth quoted February seed at $3.19, and May at $3.21⅞ per bu., an advance of 11@13c. per bu. for the week. Linseed oil settled at $1.20 per gal., in bbl., carload basis, February-March delivery, with April-May at $1.21 per gal. and June-July at $1.22 per gal., a net gain of 5c. per gal. There was a fair amount of buying by the paint trade for March forward delivery, but most of the business was placed around $1.16@$1.18 per gal., cooperage basis. Imported linseed oil sold for February shipment from Holland at $1.13 per gal., landed weights, duty paid, New York. The export market for cake was quiet and prices were easy, closing nominally at $46@$47 per ton, f.a.s. New York.

### *Flaxseed Imports Into U. K. in 1924 Larger*

Imports of flaxseed into the United Kingdom in 1924 were large, according to official trade returns, amounting to 447,486 tons, which compares with 381,506 tons in 1923 and 358,849 tons in 1922. Of the total quantity imported the Argentine supplied 299,811 tons, as against 169,973 tons in 1923 and 178,995 tons in 1922. The imports into the United Kingdom, by countries, for the past 2 years, in tons, follow:

| | 1924 | 1923 |
|---|---|---|
| Russia | 4,015 | 1,914 |
| Argentine | 299,811 | 169,973 |
| India | 121,620 | 190,464 |
| Canada | 189 | ... |
| Other Countries | 21,851 | 19,155 |
| Total | 447,486 | 381,506 |

**China Wood Oil**—After a firm start some resale offerings appeared on the market and sales took place down to 13¼c. per lb., tank cars, Pacific coast ports. Later bids for round lots at 13¼c. were turned down and final asking prices ranged from 13½@13⅝c. per lb. Oil in barrels sold at 14¼@15c. per lb., New York.

**Corn Oil**—Crude oil was in light supply. Sales of scattered cars were reported at 10½@10¾c. per lb., tanks, Chicago.

**Coconut Oil**—The market was ¼c. per lb. lower on freer offerings by Pacific coast producers. Demand was routine only, large soap makers restricting business to nearby wants. Ceylon type oil for February forward shipment from the Pacific coast sold at 9⅝c. per lb., tank car basis. In New York the market settled at 10@10¼c. per lb., tank car basis.

**Other Vegetable Oils**—Prime green olive oil foots sold at 9½c. per lb., in bbl. A distressed lot of refined rapeseed oil sold at 93c. per gal. Lagos palm oil for shipment from Africa was quiet and easier in tone on the decline in tallow, but holders continued to quote 9 60c. per lb., c.i.f. New York.

### Chem. & Met. Weighted Index of Prices for Oils and Fats

Base = 100 for 1913-14

| | |
|---|---|
| This week | 154.31 |
| Last week | 155.20 |
| Feb., 1924 | 141.05 |
| Feb., 1923 | 131.71 |

The decline in crude cottonseed oil, oleo oil and tallow offset the sharp advance in linseed oil and the weighted index number was lowered to the extent of 0.89.

Niger palm oil nominal at 8¾c. per lb. Palm kernel oil offered at 9¾c. per lb., in casks, shipment from England, with rumors of buying by soap makers on a bulk basis at approximately 9⅝c. per lb., c.i.f. New York. Better inquiry for crude soya bean oil, with sales at 11¼c. per lb., duty paid, tank cars, coast. Soya for shipment from the Orient in bulk, in bond, nominal at 8¼c. per lb., c.i.f. Pacific coast ports.

**Tallow, Etc.**—Late in the week more than 500,000 lb. of extra special tallow sold at 9½c. per lb., a decline of ⅛c. Market was under pressure. Yellow grease easy at 9c. per lb. Oleo stearine sold at 11c. per lb., an advance of ⅛c. No. 1 oleo oil nominal at 13½@14c. per lb., in bbl.

## Miscellaneous Materials

**Antimony** — Offerings of Chinese brands reported at 16¾c. per lb. a decline of ¼c. for the week. Demand has fallen off. Cookson's "C" grade nominal at 19¼c. per lb. Chinese needle, lump, nominal 10c. per lb. Standard powdered needle, 200 mesh, 11½@13c. per lb. Antimony oxide, white, Chinese, 99 per cent, 14¾@15¼c. per lb.

**Carbon Black**—Competition less keen and market developed further strength. The lower grades of carbon black now held at 8½@11c. per lb., in bags, immediate delivery. On contract the market closed at 6½@8c. per lb., as to quality and seller, an advance of ½c. per lb.

**Glycerine**—Soap lye crude, basis 80 per cent, sold at 12⅝c. per lb., loose, f.o.b. point of production, indicating that the market scarcely underwent a change in the past week. Saponification crude, basis 88 per cent, nominal at 14c. per lb., loose, works. Dynamite glycerine offered at 18½c. per lb., in drums, carload lots. Chemically pure steady at 19@19½c. per lb. in drums, carload lots.

**White Lead** — The recent decline in the metal brought out no change in prices for pigments. Demand not active, despite the guarantee against decline offer made by corroders to buyers. Standard dry white lead quoted at 12c. per lb., in bbl., and sublimed at 11½c. per lb., in bbl., carload basis. There was no change in the position of red lead, litharge and orange mineral.

**Zinc Oxide** — With no important change in the market for either the ore or the metal prices for zinc oxide were maintained on the old basis of 7⅞c. per lb. for the American process lead free, in bags, carload lots. The demand has improved, the rubber trade taking larger quantities. Consumption in the paint field is up to normal for this season of the year.

# Imports at the Port of New York

**January 23 to January 29**

**ACIDS—Boracic**—300 bg., Leghorn, Pacific Coast Borax Co. **Oxalic** — 39 csk., Hamburg, Phillip Bauer & Co.; 5 bbl., Hamburg, Order; 31 csk., Oslo, Roessler & Hasslacher Chemical Co.; 85 csk., Rotterdam, E. Suter & Co.; 90 kegs and 12 csk., Rotterdam, E. H. Sergeant & Co.; 5 cs., Rotterdam, Order; 20 csk., Hamburg, J. Munroe & Co.; 104 csk., Hamburg, Order. **Tartaric** — 818 csk., Rotterdam, W. Neuberg; 400 csk., Palermo, W. Neuberg.

**ALBUMEN** — 24 cs., Hankow, Olivier Produce Co.; 30 bbl., Trieste, Equitable Trust Co.

**AMYL ACETATE**—4 csk., Havre, G. W. Sheldon & Co.

**ANTIMONY**—15 bbl., Hamburg, Innis, Speiden & Co.; 250 cs. regulus, Shanghai, Bank of the Manhattan Co.

**ANTIMONY ORE**—145 bg., Beira, Order.

**ANTIMONY SULPHURET** — 30 csk., Havre, American Express Co.

**ASBESTOS**—6,648 bg. crude, Beira, W. D. Crumpton & Co.; 2,488 bg., London, W. D. Crumpton & Co.

**BARIUM CHLORIDE**—168 csk., Rotterdam, International Acceptance Bank.

**BARYTES**—85 csk., Rotterdam, Schall Color & Chemical Co.

**CAMPHOR** — 175 cs., Hamburg, Equitable Trust Co.; 90 csk., Hamburg, Order.

**CHALK**—515,000 kilos, Dunkirk, Taintor Trading Co.; 1,000 bg., Antwerp, Irving Bank-Col. Trust Co.; 500 bg., Antwerp, Order.

**CHEMICALS**—23 pkg., Hamburg, Jungmann & Co.; 120 csk., Rotterdam, Roessler & Hasslacher Chemical Co.; 12 csk., Rotterdam, Kidder, Peabody & Co.; 20 cs., Rotterdam, A. Klipstein & Co.; 154 csk., Fotterdam, Roessler & Hasslacher Chem. Co.; 100 csk., Rotterdam, Hans Hinrichs Chem. Co.; 97 pkg., Rotterdam, A. W. Buhlmann; 485 pkgs., Rotterdam, Order; 4 cs., Havre, Powers, Weightmann & Rosengarten; 274 bg., Glasgow, Brown Bros. & Co.; 56 csk., Glasgow, Order; 100 bbl., Bremen, A. Klipstein & Co.; 36 cs., Hamburg, E. Dietzgen Co.

**CHINA CLAY**—228 bg., Bristol, Order.

**CHROME ORE**—205 tons, Beira, U. S. Ferro Alloys Corp.; 202 tons, Beira, Standard Bank of South Africa.

**COAL-TAR DISTILLATE**—63 dr., Glasgow, Order.

**COAL-TAR INTERMEDIATES**—6 csk., Rotterdam, Kuttroff, Pickhardt & Co.; 2 csk., Rotterdam, Ciba Co.

**COBALT ORE**—191 bg., Sydney, Ledoux & Co.

**COLORS**—3 csk. aniline, Genoa, L. & R. Organic Products, Inc.; 17 csk. do., Barcelona, Newport Chemical Works; 27 cylinders do., Havre, Sandoz Chemical Works; 5 pkg. do., Havre, Carbic Color & Chemical Co.; 21 csk., Havre, American Exchange National Bank; 3 csk. aniline, Havre, Alaska Fur Dyeing Works; 3 csk. do., Havre, Order; 19 csk. alizarine, Rotterdam, Kuttroff, Pickhardt & Co.; 63 pkg. aniline, Rotterdam, Ciba Co.; 11 csk. do., Rotterdam, Color Service Corp.; 11 pkg. do., Rotterdam, H. A. Metz & Co.; 5 csk. do., Liverpool, Standard Bank of Africa; 3 csk., aniline, Havre, Irving Bank-Col. Trust Co.; 11 csk. aniline, Genoa, Irving Bank-Col. Trust Co.; 16 csk. ultramarine blue, Glasgow, A. Maharrie; 2 csk. dry, Hamburg, American Aniline Products Co.; 4 csk. do., Hamburg, Franklin Import & Export Co.; 7 pkg. aniline, Hamburg, H. A. Metz & Co.; 11 pkg. do., Hamburg, Kuttroff, Pickhardt & Co.

**COAL-TAR DISTILLATE** — 178 dr., Liverpool, Order.

**CORUNDUM ORE** — 700 bg., Delagoa Bay, Standard Bank of South Africa; 273 bg., Durban, Order.

**CREOSOTE**—65 dr., Barrow, American-Hawaiian S.S. Co.

**DEXTRINE**—350 bg., Copenhagen, Stein, Hall & Co.

**FULLERS EARTH**—850 bg., London, L. A. Salomon & Bro.

**FUSEL OIL**—2 bbl., Trieste, A. Konta; 8 csk., Valencia, Order.

**GAMBIER**—77 bg., Singapore, L. Littlejohn & Co., 265 cs., Singapore, Order; 160 bg., Singapore, Order; 142 bg. cube, Singapore, Order.

**GLAUBER SALTS**—35 bbl., Hamburg, American Aniline Products Co.; 10 dr., Antwerp, Brown Bros. & Co.

**GLYCERINE** — 50 csk., Marseilles, American Express Co.

**GUMS**—30 cs. kauri, Auckland, Brown Bros. & Co.; 100 cs. do., Auckland, Baring Bros. & Co.; 19 cs. do., Auckland, Equitable Trust Co.; 46 cs. and 366 bg. do., Auckland, Chemical National Bank; 20 cs. do., Auckland, Irving Bank-Col. Trust Co.; 115 cs. do., Auckland, Guaranty Trust Co.; 426 bg. do., Auckland, Chase National Bank; 401 cs. and 146 bg. do., Auckland, Order; 451 bg. arabic, Port Sudan, T. M. Duche & Sons; 86 bg. tragacanth, London, Thurston & Braidich; 210 bg. copal, Singapore, Brown Bros. & Co.; 140 bg. do., Singapore, Guaranty Trust Co.; 440 pkg. do., Singapore, Baring Bros. & Co.; 250 pkg. damar, Singapore, Order; 100 bg. damar, Singapore, L. C. Gillespie & Sons; 256 bg. damar, Singapore, Paterson, Boardman & Knapp; 140 bg. damar, Singapore, Baring Bros. & Co.; 100 cs. damar and 50 cs. copal, Singapore, L. C. Gillespie & Son; 406 pkg. damar and 140 bg. copal, Singapore, Order; 150 bg. damar, Singapore, Guaranty Trust Co.; 50 cs. copal, Singapore, Brown Bros. & Co.; 350 cs. damar, Batavia, Central Union Trust Co.; 300 cs. do., Batavia, Anglo-South Am. Trust Co.; 200 cs. do., Batavia, Bank of Manhattan Co.; 250 cs. do., Batavia, Order.

**IRON OXIDE**—40 bbl., Malaga, L. H. Butcher & Co.; 285 bbl., Malaga, Smith Color & Chemical Co.; 169 bbl., Malaga, C. K. Williams Co.; 80 bbl., Malaga, American Hawaiian S.S. Co.; 418 bbl., Malaga, Order; 5 csk., Liverpool, Hansen, Van Winkle Co.; 10 csk., Liverpool, J. H. Rhodes & Co.; 51 csk., Liverpool, J. A. McNulty; 160 bg. and 50 bbl., Bristol, G. Z. Collins & Co.; 60 csk., Bristol, J. Lee Smith & Co.; 228 bbl., Malaga, W. Schall & Co.; 230 bbl., Malaga, C. J. Osborn Co.; 100 bbl., Malaga, S. L. Libby Corp.; 60 bbl., Malaga, Hummel & Robinson; 136 bbl., Malaga, A. E. Rittwagen; 20 bbl., Malaga, Powers, Weightman & Rosengarten; 140 bbl., Malaga, Reichard-Coulston, Inc.; 160 bbl., Malaga, J. L. Smith & Co.

**LITHOPONE**—800 csk., Rotterdam, B. Moore & Co.; 40 csk., Rotterdam, L. H. Butcher & Co.; 1,000 csk., Antwerp, B. Moore & Co.; 40 csk., Antwerp, A. Maharrie.

**MAGNESIUM CHLORIDE** — 179 dr., Hamburg, Brown Bros. & Co.

**MAGNESITE**—101 bbl., Rotterdam, H. J. Baker & Bro.

**MYROBALANS** — 2,000 pkts., Calcutta, Order; 8,000 pkts., Calcutta, National City Bank; 8,000 pkts., Calcutta, National City Bank; 2,000 pkts., Calcutta, Order.

**OCHER**—29 csk., Marseilles, Order; 20 bbl., Malaga, C. J. Osborn Co.; 13 bbl., Malaga, Hummel & Robinson Corp.; 291 csk., Marseilles, Reichard-Coulston, Inc.

**OILS—Linseed**—285 bbl., Rotterdam, Order. **Olive foots** (sulphur oil)—500 bbl., Naples, Smith, Weihman Oil Co.; 50 bbl., Naples, St. Clair Oil Co.; 1 lot (in bulk), Bari, Banca Comm. Italo.; 500 bbl., Messina, Order; 100 bbl., Palermo, Brown Bros. & Co.; 100 bbl., Palermo, Banca Comm. Italiano. **Palm**—284 csk., Liverpool, Guaranty Trust Co.; 173 csk., Liverpool, Core & Herbert; 445 csk., Hamburg, African & Eastern Trading Co. **Sesame** — 50 csk., Marseilles, Order. **Soya**—290 dr., Copenhagen, Order. **Sperm**—100 bbl., Glasgow, Order.

**OILSEEDS—Copra**—216 bg., Morant Bay, Franklin Baker Co.; 24 bg., Annetto Bay, Order.

**PHOSPHORUS**—1 cs., Gothenburg, P. Bauer & Co.

**PLUMBAGO**—76 bbl., Colombo, H. P. Winter & Co.; 270 bg., Colombo, Order.

**POTASSIUM SALTS** — 168 dr. caustic, Rotterdam, H. Hollesen; 455,000 kilos of 20 per cent potash (in bulk), Dunkirk, Societe Comm. des Potasses d'Alsace; 178 bbl. perchlorate, Tocopilla, W. R. Grace & Co.

**QUEBRACHO**—1,987 bg., Buenos Aires, Commonwealth Atlantic National Bank.

**QUICKSILVER** — 300 flasks, Leghorn, Leghorn Trading Co.

**SAL AMMONIAC**—37 csk., Hamburg, Lo Curto & Funk.

**SHELLAC** — 100 bg., Hamburg, Ralli Bros.; 390 bg., Calcutta, Brown Bros. & Co.; 100 bg., Calcutta, First National Bank of Boston; 50 bg. seedlac, Calcutta, N. Y. Trust Co.; 551 bg., Calcutta, Order; 33 cs., Rotterdam, C. F. Gerlach; 50 cs., Singapore, American Exchange National Bank; 500 bg., Calcutta, National City Bank; 300 bg. and 100 bg. seedlac, Calcutta, Order; 175 cs. sticklac, Bangkok, Order; 100 bg., London, Order; 100 bg., Hamburg, Ralli Bros.

**SODIUM SALTS** — 23,885 bg. nitrate, Mejillones, A. Gibbs & Co.; 14,095 bg. do., Junin, A. Gibbs & Co.; 458 bg. nitrate, Oslo, Seldner & Enequist; 60 csk. prussiate, Rotterdam, Order; 100 bbl. fluoride, Rotterdam, Order; 5 csk. sulphocyanide, Liverpool, J. W. Hampton Jr. & Co.; 40 kegs hydrosulphite, Liverpool, Kuttroff, Pickhardt & Co.; 116 dr. cyanide, Liverpool, Order; 20 cs. peroxide, Havre, Cooper & Cooper, Inc.; 200 cans cyanide, Oran, Anglo-South Am. Trust Co.; 19,947 bg. nitrate, Antofagasta, W. R. Grace & Co.; 4,405 bg. do., Iquique, W. R. Grace & Co.

**STARCH**—1,000 bg. potato, Copenhagen, Stein, Hall & Co.; 250 bg., Rotterdam, Order.

**STRONTIUM NITRATE**—141 csk., Rotterdam, Hummel & Robinson Corp.

**TALC**—200 bg., Genoa, Kountze Bros.; 600 bg., Marseilles, L. A. Salomon & Bro.; 400 bg., Marseilles, Moore & Munger; 300 bg., Marseilles, Whittaker, Clark & Daniels; 325 bg., Genoa, Kountze Bros.; 200 bg., Genoa, Hammill & Gillespie; 300 bg., Genoa, C. Mathieu.

**TARTAR** — 74 bg., Valencia, Tartar Chemical Works; 129 bg., Alicante, C. Pfizer & Co.; 116 bg., Rotterdam, C. Pfizer & Co.; 22 cs., Leghorn, Royal Baking Powder Co.; 50 bbl., Genoa, C. L. Huisking; 87 bg., Catania, Order; 100 bg., Marseilles, C. Pfizer & Co.

**VANADIUM ORE** — 8,800 bg., Callao, Vanadium Corp. of America; 1,646 bg., Hamburg, Electro Metallurgical Co.

**WATTLE BARK** — 238 bg., Durban, Irving Bank-Col. Trust Co.; 6,462 bg., Durban, Order.

**WAXES** — 34 bl. beeswax, Rotterdam, Ponds Extract Co.; 14 bg. do., Azua, J. J. Julia & Co.; 5 bg. do., Azua, Selma Mercantile Co.; 8 pkg. do., Puerto Plata, Order; 5 pkg. do., Monte Christy, Order; 21 bl. beeswax, Liverpool, Order; 74 cs. spermaceti, Glasgow, Coal & Iron National Bank; 1,200 bg. paraffine, Balikpapan, Asiatic Petroleum Co.; 50 bg. mineral, Hamburg, L. S. Painter.

**WHITE LEAD**—98 bbl., Trieste, Fezandie & Sperrle.

**WOOL GREASE**—73 cs., London, Lehn & Fink; 100 bbl., Bremen, Pfaltz & Bauer.

## Rising Tendency to Prices for Chemicals in Sweden

A report from Stockholm states that the turnover on the chemical market in Sweden during December showed the usual seasonal decrease, especially during the last fortnight Prices, however, with a few exceptions were maintained. The second half of 1924 was marked by a firm or rising tendency in prices in Sweden as abroad, although the increase on the Swedish market was less accentuated in consequence of the limitation of activity in several consuming industries owing to the high cost of production. Experts state that the turnover in chemicals during 1924 did not exceed that of 1923.

# Current Prices in the New York Market

***For Chemicals, Oils and Allied Products***

## Industrial Chemicals

| | | | |
|---|---|---|---|
| Acetone, drums, works | lb. | $0.10 | $0.11 |
| Acetic anhydride, 85 %, dr | lb. | .36 | .38 |
| Acid, acetic, 28%, bbl. 100 | lb. | 3.12 | 3.37 |
| Acetic, 56%, bbl. 100 | lb. | 5.85 | 6.10 |
| Acetic, 80%, bbl. 100 | lb. | 8.19 | 8.44 |
| Glacial, 99½%, bbl. 100 | lb. | 11.01 | 11.51 |
| Boric, bbl. | lb. | .10½ | .10½ |
| Citric, kegs | lb. | .45½ | .46½ |
| Formic, 85% | lb. | .10½ | .10½ |
| Gallic, tech. | lb. | .45½ | .47 |
| Hydrofluoric, 52%, carboys | lb. | .11 | .12 |
| Lactic, 44%, tech., light, bbl. | lb. | .13½ | .14 |
| 22% tech., light, bbl. | lb. | .06½ | .07 |
| Muriatic, 18° tanks 100 | lb. | .80 | .85 |
| Muriatic, 20°, tanks 100 | lb. | .95 | 1.00 |
| Nitric, 36°, carboys | lb. | .04 | .04½ |
| Nitric, 42°, carboys | lb. | .04½ | .05½ |
| Oleum, 20%, tanks | ton | 16.00 | 17.00 |
| Oxalic, crystals, bbl. | lb. | .10½ | .11 |
| Phosphoric, 50% carboys, | lb. | .07½ | .07½ |
| Pyrogallic, resublimed | lb. | 1.55 | 1.60 |
| Sulphuric, 60°, tanks | ton | 8.50 | 9.50 |
| Sulphuric, 60°, drums | ton | 12.50 | 13.50 |
| Sulphuric, 66°, tanks | ton | 13.50 | 14.50 |
| Sulphuric, 66°, drums | ton | 17.50 | 18.50 |
| Tannic, U.S.P., bbl. | lb. | .65 | .70 |
| Tannic, tech., bbl | lb. | .45 | .50 |
| Tartaric, imp., powd., bbl. | lb. | .27½ | .28 |
| Tartaric, domestic, bbl. | lb. | .29 | .30 |
| Tungstic, per lb. | lb. | 1.20 | 1.25 |
| Alcohol, butyl, drums, wks. | lb. | .27 | .30 |
| Ethyl, 190 p'f. U.S.P., bbl. | gal. | 4.89 | |
| Denatured, 190 proof No. 1, special bbl. | gal. | .61 | |
| No. 1, 190 proof, special, dr. | gal. | .55 | |
| No. 1, 188 proof, bbl. | gal. | .65 | |
| No. 1, 188 proof, dr. | gal. | .58 | |
| No. 5, 188 proof, bbl. | gal. | .60 | |
| No. 5, 188 proof, dr. | gal. | .54 | |
| Alum, ammonia, lump, bbl. | lb. | .03½ | .04 |
| Potash, lump, bbl. | lb. | .03 | .03½ |
| Chrome, lump, potash, bbl. | lb. | .05½ | .06 |
| Aluminum sulphate, com., bags 100 | lb. | 1.40 | 1.45 |
| Iron free, bags | lb. | 2.40 | 2.45 |
| Aqua ammonia, 26°, drums | lb. | .06½ | .06½ |
| Ammonia, anhydrous, cyl. | lb. | .28 | .30 |
| Ammonium carbonate, powd. tech., casks | lb. | .12 | .12½ |
| Nitrate, tech., casks | lb. | .09 | .10 |
| Amyl acetate tech., drums | gal. | 3.25 | 3.50 |
| Antimony oxide, white, bbl. | lb. | .14½ | .16 |
| Arsenic, white, powd., bbl. | lb. | .05½ | .06 |
| Red, powd., kegs | lb. | .14½ | .15½ |
| Barium carbonate, bbl. | ton | 55.00 | 57.00 |
| Chloride, bbl. | ton | 67.00 | 68.00 |
| Dioxide, 88%, drums | lb. | .17½ | .18 |
| Nitrate, casks | | .07½ | .08½ |
| Blanc fixe, dry, bbl. | lb. | .03½ | .03½ |
| Bleaching powder, f.o.b. wks., drums, contract 100 | lb. | 1.90 | |
| Spot, wks., drums 100 | lb. | 2.00 | 2.15 |
| Borax, bbl. | lb. | .05 | .05½ |
| Bromine, cases | lb. | .47 | .48 |
| Calcium acetate, bags 100 | lb. | 3.00 | 3.05 |
| Arsenate, dr. | lb. | .08 | .08½ |
| Carbide, drums | lb. | .05 | .05½ |
| Chloride, fused, dr. wks. | ton | 21.00 | |
| Gran. drums works | ton | 27.00 | |
| Phosphate, mono, bbl. | lb. | .06½ | .07½ |
| Carbon bisulphide, drums | lb. | .06 | .06½ |
| Tetrachloride, drums | lb. | .07 | .07½ |
| Chalk, precip.—domestic, light, bbl. | lb. | .04½ | .04½ |
| Imported, light, bbl. | lb. | .04½ | .05 |
| Chlorine, liquid, tanks, wks. | lb. | .04½ | |
| Contract, tanks, wks. | lb. | .04 | |
| Cylinders, 100 lb., wks. | lb. | .05½ | .07½ |
| Cobalt, oxide, bbl. | lb. | 2.10 | 2.25 |
| Copperas, bulk, f.o.b. wks. | ton | 15.00 | 16.00 |
| Copper carbonate, bbl. | lb. | .16½ | .17 |
| Cyanide, drums | lb. | .49 | .50 |
| Oxide, kegs | lb. | .16½ | .16½ |
| Sulphate, dom., bbl. 100 | lb. | 4.75 | 4.80 |
| Imp. bbl. 100 | lb. | 4.62½ | |
| Cream of tartar, bbl. | lb. | .21 | .21½ |
| Epsom salt, dom., bbl. 100 | lb. | 1.75 | 2.00 |
| Imp., tech., bags 100 | lb. | 1.35 | 1.40 |
| U.S.P., dom., bbl. 100 | lb. | 2.10 | 2.35 |
| Ether, U.S.P., dr consent'd. | lb. | .15 | .16 |
| Ethyl acetate, 85%, drums | gal. | .92 | .95 |
| Acetate, 99%, dr. | gal. | 1.08 | 1.10 |
| Formaldehyde, 40%, bbl. | lb. | .09 | .09½ |
| Fullers earth—f.o.b. mines | ton | 7.50 | 18.00 |
| Furfural, works, bbl. | lb. | .23 | |
| Fusel oil, ref., drums | gal. | 3.50 | 4.00 |
| Crude, drums | gal. | 2.60 | 2.80 |
| Glaubers salt, wks., bags 100 | lb. | 1.20 | 1.40 |
| Imp., bags 100 | lb. | .80 | .90 |
| Glycerine, c. p., drums extra | lb. | .19 | .19½ |
| Crude 80%, loose | lb. | .12½ | .12½ |
| Hexamethylene, drums | lb | .65 | .67 |

THESE prices are first-hand quotations in the New York market for industrial chemicals, coal-tar products and related materials used in the industries that produce

| | |
|---|---|
| **Dyes** | **Paper and Pulp** |
| **Paint and Varnish** | **Petroleum** |
| **Ceramic Materials** | **Soap** |
| **Fertilizers** | **Explosives** |
| **Rubber** | **Food Products** |
| **Sugar** | **Metal Products** |

Whenever available these prices are those of the American manufacturer. If for material f.o.b. works or on a contract basis, quotations are so designated. All prices refer to large quantities in original packages.

| | | | |
|---|---|---|---|
| Lead: | | | |
| White basic carbonate, dry, casks | lb. | $0.12 | |
| White, basic sulphate, casks | lb. | .11½ | |
| White, in oil, kegs | lb. | .1347 | |
| Red, dry, casks | lb. | .1375 | |
| Red, in oil, kegs | lb. | .1478 | |
| Acetate, white crys., bbl. | lb. | .15½ | |
| Brown, broken, casks | lb. | .14½ | |
| Arsenate, white crys., bbl. | lb. | .16 | $0.18 |
| Lime-Hydrated, b.g., wks. | ton | 10.50 | 12.50 |
| Bbl., wks. | ton | 18.00 | 19.00 |
| Lump, bbl. 280 | lb. | 3.63 | 3.65 |
| Litharge, comm., casks | lb. | .13½ | |
| Lithopone, bags | lb. | .06 | .06½ |
| Magnesium carb., tech., bags | lb. | .07 | .08 |
| Methanol, 95%, drums | gal. | .70 | .72 |
| 97%, drums | gal. | .72 | .74 |
| Pure, tanks | gal. | .74 | .76 |
| drums | gal. | .78 | .80 |
| bbl. | gal. | .83 | .85 |
| Methyl-acetone, t'ks | gal. | .70 | |
| Nickel salt, double, bbl. | lb. | .10 | |
| Single, bbl. | lb. | .10½ | |
| Orange mineral, cak | lb. | .16½ | .17 |
| Phosgene | | .60 | .75 |
| Phosphorus, red, cases | lb. | .70 | .75 |
| Yellow, cases | lb. | .37½ | .40 |
| Potassium bichromate, casks | lb. | .08½ | .08½ |
| Bromide, gran., bbl. | lb. | .42 | .48 |
| Carbonate, 80–85%, calcined, casks | lb. | .06 | .06½ |
| Chlorate, powd. | lb. | .06½ | .08½ |
| Cyanide, drums | lb. | .47 | .52 |
| First sorts, cask | lb. | .08½ | .08½ |
| Hydroxide (caustic potash) drums | lb. | .07½ | .07½ |
| Iodide, cases | lb. | 3.65 | 3.75 |
| Nitrate, bbl. | lb. | .06 | .07½ |
| Permanganate, drums | lb. | .14½ | .14½ |
| Prussiate, red, casks | lb. | .38 | .38½ |
| Prussiate, yellow, casks | lb. | .18 | .18½ |
| Salammoniac, white, gran., casks, imported | lb. | .05½ | .06 |
| White, gran., bbl., domestic | lb. | .07 | .07½ |
| Gray, gran., casks | lb. | .08 | .09 |
| Salsoda, bbl. 100 | lb. | 1.20 | 1.40 |
| Salt cake (bulk) works | ton | 17.00 | 19.00 |
| Soda ash, light 58% flat, bulk, contract 100 | lb. | 1.25 | |
| bags, contract 100 | lb. | 1.38 | |
| Dense, bulk, contract, basis 58% 100 | lb. | 1.35 | |
| bags, contract 100 | lb. | 1.45 | |
| Soda, caustic, 76%, solid, drums contract 100 | lb. | 3.10 | |
| Caustic, ground and flake, contracts, dr. 100 | lb. | 3.50 | 3.85 |
| Caustic, solid, 76% f.a.s. N. Y. 100 | lb. | 2.95 | 3.05 |
| Sodium acetate, works, bbl. | lb. | .05 | .05½ |
| Bicarbonate, bulk 100 | lb. | 1.75 | |
| Bichromate, casks | lb. | .06½ | .06½ |
| Bisulphate (niter cake) | ton | 6.00 | 7.00 |
| Bisulphite, powd., U.S.P., bbl. | lb. | .04½ | .04½ |
| Bromide, bbl. | lb. | .43 | .47 |
| Chlorate, kegs | lb. | .06½ | .06½ |
| Chloride long | ton | 12.00 | 13.00 |
| Cyanide, cases | lb. | .19 | .22 |
| Flouride, bbl. | lb. | .09 | .09½ |
| Hyposulphite, bbl. | lb. | .02½ | .02½ |
| Nitrite, casks | lb. | .09 | .09½ |
| Peroxide, powd., cases | lb. | .23 | .27 |
| Phosphate, dibasic, bbl. | lb. | .03½ | .03½ |
| Prussiate, yel. bbl. | lb. | .10 | .10½ |
| Salicylate, drums | lb. | $0.38 | $0.40 |
| Silicate (40°, drums) 100 | lb. | .75 | 1.16 |
| Silicate (60°, drums) 100 | lb. | 1.75 | 2.00 |
| Sulphide, fused, 60-62%, drums | lb. | .02½ | .03½ |
| Sulphite, crys., bbl. | lb. | .03½ | .03½ |
| Strontium nitrate, powd., bbl | lb. | .09½ | .10 |
| Sulphur chloride, yel drums | lb. | .04½ | .05 |
| Crude | ton | 18.00 | 19.00 |
| At mine, bulk | ton | 14.00 | 16.00 |
| Flour, bag 100 | lb. | 2.25 | 2.35 |
| Dioxide, liquid, cyl. | lb. | .08 | .08½ |
| Tin bichloride, bbl. | lb. | .16½ | |
| Oxide, bbl. | lb. | .61 | |
| Crystals, bbl. | lb. | .40½ | |
| Zinc carbonate, bags | lb. | .12 | .14 |
| Chloride, gran., bags | lb. | .06 | .07½ |
| Cyanide, drums | lb. | .40 | .41 |
| Dust bbl. | lb. | .08 | .08½ |
| Oxide, lead free, bags | lb. | .07½ | |
| 5% lead sulphate bags | lb. | .06½ | |
| French, red seal, bags | lb. | .09½ | |
| French, green seal, bags | lb. | .10½ | |
| French, white seal, bbl. | lb. | .11½ | |
| Sulphate, bbl. 100 | lb. | 3.25 | 3.50 |

## Coal-Tar Products

| | | | |
|---|---|---|---|
| Alpha-naphthol, crude, bbl. | lb. | $0.60 | $0.62 |
| Alpha-naphthol, ref., bbl. | lb. | .75 | .80 |
| Alpha-naphthylamine, bbl. | lb. | .35 | .36 |
| Aniline oil, drums | lb. | .16 | .16½ |
| Aniline salt, bbl. | lb. | .22 | .23 |
| Anthracene, 80%, drums | lb. | .65 | .70 |
| Anthraquinone, 25%, drums | lb. | .65 | .67 |
| Benzaldehyde U.S.P., tech., drums | lb. | .69 | .71 |
| Benzene, pure, tanks, works | gal. | .23 | |
| Benzene, 90%, tanks, works | gal. | .21 | |
| Benzidine base, bbl. | lb. | .75 | .78 |
| Benzyl chloride, ref. carboys | lb. | .35 | |
| Benzyl chloride, tech., drums | lb. | .25 | |
| Beta-naphthol, tech., bbl. | lb. | .24 | .25 |
| Beta-naphthylamine, tech. | lb. | .65 | .70 |
| Cresylic acid, 97%, drums | gal. | .59 | .62 |
| 95-97%, drums, works | gal. | .55 | .57 |
| Dichlorbenzene, drums | lb. | .07 | .08½ |
| Dinitrobenzene, bbl. | lb. | .15 | .16 |
| Dinitrochlorbenzene, bbl. | lb. | .20 | .21 |
| Dinitrophenol, bbl. | lb. | .35 | .40 |
| Dinitrotoluen, bbl. | lb. | .18 | .20 |
| Dip oil, 25%, drums | gal. | .26 | .26 |
| H-acid, bbl. | lb. | .70 | .74 |
| Meta-phenylenediamine, bbl. | lb. | .90 | .95 |
| Monochlorbenzene, drums | lb. | .08½ | .10 |
| Naphthalene, flake, bbl. | lb. | .05 | .05½ |
| Naphthionate of soda, bbl. | lb. | .60 | .65 |
| Naphthionic acid, crude, bbl. | lb. | .60 | .62 |
| Nitrobenzene, drums | lb. | .09 | .09½ |
| Nitro-naphthalene, bbl. | lb. | .25 | .27 |
| Nitro-toluene, drums | lb. | .13½ | .14 |
| N-W acid, bbl. | lb. | 1.05 | 1.10 |
| Ortho-amidophenol, kegs | lb. | 2.40 | 2.50 |
| Ortho-dichlorbenzene, drums | lb. | .10 | .11 |
| Ortho-toluidine, bbl. | lb. | .17 | .18 |
| Para-aminophenol, base, kegs | lb. | 1.15 | 1.20 |
| Para-dichlorbenzene, bbl. | lb. | .17 | .20 |
| Para-nitraniline, bbl | lb. | .65 | .67 |
| Para-nitrotoluene, bbl. | lb. | .40 | .42 |
| Para-phenylendiamine, bbl. | lb. | 1.25 | 1.35 |
| Para-toluidine, bbl. | lb. | .70 | .75 |
| Phenol, U.S.P., dr. | lb. | .23 | .25 |
| Picric acid, bbl. | lb. | .20 | .22 |
| Pitch, tanks, works | ton | 27.00 | 30.00 |
| Pyridine, imp., drums | gal. | 4.15 | 4.25 |
| Resorcinol, tech., kegs | lb. | 1.30 | 1.40 |
| Resorcinol, pure, kegs | lb. | 2.00 | 2.25 |
| R-salt, bbl. | lb. | .50 | .55 |
| Salicylic acid, tech., bbl. | lb. | .34 | .36 |
| Salicylic acid, U.S.P., bbl. | lb. | .35 | |
| Solvent naphtha, water-white, tanks | gal. | .24 | .25 |
| Crude, tanks | gal. | .21 | .22 |
| Sulphanilic acid, crude, bbl. | lb. | .16 | .18 |
| Tolidine, bbl. | lb. | 1.00 | 1.05 |
| Toluidine, mixed, kegs | lb. | .30 | .35 |
| Toluene, tank cars, works | gal. | .26 | |
| Toluene, drums, works | gal. | .31 | |
| Xylidine, drums | lb. | .40 | .42 |
| Xylene, 5 deg.-tanks | gal. | .34 | .36 |
| Xylene, com., tanks | gal. | .24 | .26 |

## Naval Stores

| | | | |
|---|---|---|---|
| Rosin B-D, bbl. 280 | lb. | $8.30 | $8.40 |
| Rosin E-I, bbl. 280 | lb. | 8.40 | 8.50 |
| Rosin K-N, bbl. 280 | lb. | 8.60 | 8.80 |
| Rosin W.G.-W.W., bbl. 280 | lb. | 9.50 | 10.25 |
| Turpentine, spirits of, bbl. | gal. | .94 | .94½ |
| Wood, steam dist., bbl. | gal. | .82 | .82½ |
| Wood, dest. dist., bbl. | gal. | .72 | .73 |
| Pine tar pitch, bbl. 200 | lb. | 5.50 | |
| Tar, kiln burned, bbl. 500 | lb. | 12.00 | 12.50 |
| Rosin oil, first run, bbl. | gal. | .45 | |
| Pine tar oil, com'l. | gal. | .30 | |

## Animal Oils and Fats

| | | | |
|---|---|---|---|
| Degras, bbl. | lb. | $0.03½ – | $0.05½ |
| Grease, yellow, loose | lb. | .09 – | .09½ |
| Lard oil, Extra No. 1, bbl. | gal. | .96 – | .98½ |
| Lard compound, bbl. | lb. | .13½ – | .13¾ |
| Neatsfootoil, 20 deg. bbl. | gal. | 1.35 – | 1.37 |
| Oleo Stearine | | .11 – | ..... |
| Oleo oil, No. 1, bbl. | lb. | .13½ – | ..... |
| Red oil, distilled, d.p. bbl. | lb. | .11 – | .11½ |
| Tallow, extra, loose works | lb. | .09½ – | ..... |
| Tallow oil, acidless, bbl. | gal. | .92 – | .94 |

## Vegetable Oils

| | | | |
|---|---|---|---|
| Castor oil, No. 3, bbl. | lb. | $0.17 – | $0.17½ |
| Castor oil, No. 1, bbl. | lb. | .17½ – | .17¾ |
| Chinawood oil, bbl. | lb. | .15 – | .15½ |
| Coconut oil, Ceylon, bbl. | lb. | .11½ – | .11¾ |
| Ceylon, tanks, N. Y. | lb. | .10 – | .10¼ |
| Corn oil, crude, bbl. | lb. | .12½ – | ..... |
| Crude, tanks, (f.o.b. mill) | lb. | .10¼ – | ..... |
| Cottonseed oil, crude (f.o.b. mill), tanks | lb. | .09½ – | ..... |
| Summer yellow, bbl. | lb. | .11½ – | .11¾ |
| Linseed oil, raw, car lots, bbl. | gal. | 1.20 – | ..... |
| Raw, tank cars (dom.) | gal. | 1.14 – | ..... |
| Boiled, cars, bbl. (dom.) | gal. | 1.22 – | ..... |
| Olive oil, denatured, bbl. | gal. | 1.18 – | 1.22 |
| Sulphur, (foots) bbl. | lb. | .09½ – | .09¾ |
| Palm, Lagos, casks | lb. | .09½ – | ..... |
| Niger, casks | lb. | .09 – | .09½ |
| Palm kernel, bbl. | lb. | .10 – | .10¼ |
| Peanut oil, crude, tanks (mill) | lb. | .11 – | .11½ |
| Refined, bbl. | lb. | .16 – | .16½ |
| Perilla, bbl. | lb. | .14 – | .14½ |
| Rapeseed oil, refined, bbl. | gal. | .93 – | .97 |
| Sesame, bbl. | lb. | .15 – | .15½ |
| Soya bean (Manchurian), bbl | lb. | .13 – | ..... |
| Tank, f.o.b. Pacific Coast | lb. | .11½ – | .11¾ |

## Fish Oils

| | | | |
|---|---|---|---|
| Cod, Newfoundland, bbl. | gal. | $0.64 – | $0.66 |
| Menhaden, light pressed, bbl. | gal. | .70 – | .72 |
| White bleached, bbl | gal. | .72 – | .74 |
| Crude, tanks (f.o.b. factory) | gal. | .55 – | .... |
| Whale No. 1 crude, tanks, coast | lb. | ..... – | ..... |
| Winter, natural, bbl. | gal. | .75 – | .76 |
| Winter, bleached, bbl. | gal. | .78 – | .... |

## Dye & Tanning Materials

| | | | |
|---|---|---|---|
| Albumen, blood, bbl. | lb. | $0.50 – | $0.55 |
| Albumen, egg, tech, kegs | lb. | .90 – | .95 |
| Cochineal, bags | lb. | .33 – | .35 |
| Cutch, Borneo, bales | lb. | .04¼ – | .05 |
| Rangoon, bales | lb. | .13 – | .13½ |
| Dextrine, corn, bags 100 | lb. | 4.67 – | 4.87 |
| Gum, bags 100 | lb. | 4.94 – | 5.07 |
| Divi-divi, bags | ton | 42.00 – | 43.00 |
| Fustic, sticks | ton | 30.00 – | 35.00 |
| Chips, bags | lb. | .04 – | .05 |
| Gambier com., bags | lb. | .18 – | .19 |
| Logwood, sticks | ton | 25.00 – | 26.00 |
| Chips, bags | lb. | .02½ – | .03 |
| Sumac, leaves, Sicily, bags | ton | 170 00 – | 175.00 |
| Domestic, bags | ton | 50.00 – | 55.00 |
| Starch, corn, bags 100 | lb. | 4.02 – | 4.29 |

## Extracts

| | | | |
|---|---|---|---|
| Archil, cone., bbl. | lb. | $0.16 – | $0.19 |
| Chestnut, 25% tannin, tanks | lb. | .01½ – | .02½ |
| Divi-divi, 25% tannin, bbl. | lb. | .05 – | .05 |
| Fustic, liquid, 42°, bbl. | lb. | .08 – | .09½ |
| Gambier, liq., 25% tannin, bbl. | lb. | .13½ – | .14 |
| Hematine crys., bbl. | lb. | .14 – | .18 |
| Hemlock, 25% tannin, bbl. | lb. | .03½ – | .04 |
| Hypernic, liquid, 51°, bbl. | lb. | .12 – | .13 |
| Logwood, crys., bbl. | lb. | .14 – | .15 |
| Liq., 51°, bbl. | lb. | .07½ – | .08½ |
| Osage Orange, 51°, liquid, bbl. | lb. | .07 – | .08 |
| Quebracho, solid, 65% tannin, bbl. | lb. | .04½ – | .04¾ |
| Sumac, dom., 51°, bbl. | lb. | .06½ – | .06¾ |

## Dry Colors

| | | | |
|---|---|---|---|
| Blacks–Carbongas, bags, f.o.b. works, contract | lb. | $0.06½ – | $0.08½ |
| spot, bags | lb. | .09 – | .12 |
| Lampblack, bbl. | lb. | .12 – | .40 |
| Mineral, bulk | ton | 35.00 – | 45.00 |
| Blues–Prussian, bbl. | lb. | .35 – | .37 |
| Ultramarine, bbl. | lb. | .08 – | .35 |
| Browns, Sienna, Ital., bbl. | lb. | .05 – | .12 |
| Sienna, Domestic, bbl. | lb. | .03 – | .03½ |
| Umber, Turkey, bbl. | lb. | .04 – | .04½ |
| Greens–Chrome, C.P.Light, bbl. | lb. | .30 – | .32 |
| Chrome, commercial, bbl. | lb. | .11 – | .12 |
| Paris, bulk | lb. | .24 – | .26 |
| Reds, Carmine No. 40, tins | lb. | 4.25 – | 4.50 |
| Iron oxide red, casks | lb. | .08 – | .12 |
| Para toner, kegs | lb. | .95 – | 1.00 |
| Vermilion, English, bbl. | lb. | 1.40 – | 1.45 |
| Yellow, Chrome, C.P. bbls | lb. | .20 – | .22 |
| Ocher, French, casks | lb. | .02 – | .03 |

## Waxes

| | | | |
|---|---|---|---|
| Beeswax, crude, Afr. bg. | lb. | $0.39½ – | $0.40 |
| Refined, light, bags | lb. | .50 – | .52 |
| Candellila, bags | lb. | .29 – | .30 |
| Carnauba, No. 1, bags | lb. | .37 – | .38 |
| No. 2, North Country, bags | lb. | .31 – | .32 |
| No. 3, North Country, bags | lb. | .27½ – | .28 |
| Japan, cases | lb. | $0 16 – | $0 16½ |
| Montan, crude, bags | lb. | .06 – | .06† |
| Paraffine, crude, match, 105-110 m.p., bbl. | lb. | .06½ – | .06¾ |
| Crude, scale 124-126 m.p. bags | lb. | .05½ – | ..... |
| Ref., 118-120 m.p. bags | lb. | .06 – | .06½ |
| Ref., 123-125 m.p., bags | lb. | .06½ – | .06¾ |
| Stearic acid, agle. pressed, bags | lb. | .12½ – | .13 |
| Double pressed, bags | lb. | .13½ – | .14 |

## Fertilizers

| | | | |
|---|---|---|---|
| Acid phosphate, 16% wks. | ton | $7.50 – | $7.75 |
| Ammonium sulphate, bulk f.o.b. works 100 | lb. | 2.75 – | ..... |
| Blood, dried, bulk | unit | 3.85 – | 3.95 |
| Bone, raw, 3 and 50, ground | ton | 26.00 – | 28.00 |
| Fish scrap, dom., dried, wks. | unit | 5.00 – | ..... |
| Nitrate of soda, bags 100 | lb. | 2.62 – | ..... |
| Tankage, high grade, f.o.b. Chicago | unit | 3.10 – | 3.20 |
| Phosphate rock, f.o.b. mines | | | |
| Florida pebble, 68-72%.... | ton | 3.00 – | 3.50 |
| Tennessee, 75%.... | ton | 6.50 – | 6.75 |
| Potassium muriate, 80%, bags | ton | 34.55 – | ..... |
| Sulphate, bags, 90%.... | ton | 45.85 – | ..... |
| Double manure salt, bgs. | ton | 26.35 – | ..... |
| Kainit, 14%, bgs | ton | 10.25 – | ..... |

## Crude Rubber

| | | | |
|---|---|---|---|
| Para—Upriver fine | lb. | $0.33½ – | 0.34 |
| Upriver coarse | lb. | .26½ – | .27 |
| Plantation—First latex crepe | lb. | .35½ – | .36 |
| Ribbed smoked sheets | lb. | .35½ – | .36 |

## Gums

| | | | |
|---|---|---|---|
| Copal, Congo, amber, bags | lb. | $0.08½ – | $0.10 |
| East Indian, bold, bags | lb. | .14 – | .15 |
| Manila, amber, bags | lb. | .14 – | .16 |
| Damar, Batavia, cases | lb. | .28½ – | .28¾ |
| Singapore, No. 1, cases | lb. | .31 – | .31½ |
| Singapore, No. 2, cases | lb. | .21 – | .21½ |
| Kauri, No. 1, cases | lb. | .58 – | .64 |
| Ordinary chips, cases | lb. | .21 – | .22 |
| Manjak, Barbados, bags | lb. | .06 – | .12 |

## Shellac

| | | | |
|---|---|---|---|
| Shellac, orange fine, bags | lb. | $0.64 – | $0.65 |
| Orange superfine, bags | lb. | .66 – | .67 |
| Bleached, bonedry | lb. | .71 – | .73 |
| T. N., bags | lb. | .62 – | .63 |

## Miscellaneous Materials

| | | | |
|---|---|---|---|
| Asbestos, crude No. 1 f.o.b., Quebec | sh. ton | $325.00– | $400.00 |
| Shingle, f.o.b., Quebec | sh. ton | 45.00 – | 50.00 |
| Cement, f.o.b., Quebec | sh. ton | 15.00 – | 20.00 |
| Barytes, grd., white, f.o.b. mills, bbl. | net ton | 17.00 – | 17.50 |
| Grd., off-color, f.o.b., Balt | net ton | 13.00 – | 14.00 |
| Floated, f.o.b., St. Louis, bbl. | net ton | 23.00 – | 24.00 |
| Crude f.o.b. mines, bulk | net ton | 8.00 – | 8 50 |
| Casein, bbl., tech. | lb. | .11½ – | 13 |
| China clay (kaolin) crude, No. 1, f.o.b. Ga. | net ton | 6.50 – | 8.00 |
| Powd., f.o.b. Ga. | net ton | 12.00 – | 15.00 |
| Crude, f.o.b. Va. | net ton | 5.50 – | 7.00 |
| Ground, f.o.b. Va. | net ton | 10.00 – | 20.00 |
| Imp., powd. | net ton | 45.00 – | 50.00 |
| Feldspar, No. 1f.o.b.N.C. | long ton | 6.50 – | 7.25 |
| No. 2 f.o.b. N.C. | long ton | 4.50 – | 5.00 |
| No. 1 gr'd. Me. | long ton | 19.00 – | 20.00 |
| No. 1 Can., f.o.b., mill, powd. | long ton | 25.00 – | ..... |
| Graphite, Ceylon, lump, first quality, bbl. | lb. | .07 – | .07½ |
| High grade amorphous crude | ton | 15.00 – | 35.00 |
| Gum arabic, amber, sorts, bags | lb. | .13 – | .13½ |
| Tragacanth, sorts, bags | lb. | .50 – | .55 |
| No. 1, bags | lb. | 1.15 – | 1.20 |
| Kieselguhr, f.o.b. Cal. | ton | 40.00 – | 42.00 |
| F.o.b. N.Y. | ton | 50.00 – | 55.00 |
| Magnesite, calcined | ton | 35.00 – | 42.50 |
| Pumice stone, imp., casks | lb. | .03 – | .40 |
| Dom., lump, bbl. | lb. | .06 – | .08 |
| Dom., ground, bbl. | lb. | .03 – | .05 |
| Silica, glass sand, f.o.b. Ind. | ton | 2.00 – | 2.25 |
| Sand blast, f.o.b. Ind. | ton | 2.25 – | 3.50 |
| Amorphous, 200-mesh, f.o.b. Ill. | ton | 20.00 – | ..... |
| Glass sand, f.o.b. Ill. | ton | 2.00 – | 2.25 |
| Soapstone, coarse, f.o.b., Vt., bags | ton | 7.00 – | 7.50 |
| Talc, 200 mesh, f.o.b., Vt., bags, extra | ton | 10.50 – | ..... |
| 200 mesh, f.o.b., Ga. | ton | 7.50 – | 10.00 |
| 325 mesh, f.o.b. New York, grade A | ton | 14.75 – | ..... |

## Mineral Oils

Crude, at Wells

| | | | |
|---|---|---|---|
| Pennsylvania | bbl. | $3.00 – | $3.10 |
| Corning | bbl. | 1.75 – | ..... |
| Cabell | bbl. | 1.70 – | ..... |
| Somerset | bbl. | 1.80 – | ..... |
| Illinois | bbl. | 1.37 – | ..... |
| Indiana | bbl. | 1.38 – | ..... |
| Kansas and Okla. under 28 deg. | bbl. | .75 – | .85 |
| California, 35 deg. and up | bbl. | .40 – | ..... |

## Gasoline, Etc.

| | | | |
|---|---|---|---|
| Motor gasoline steel bbls. | gal. | $0.18½ – | ..... |
| Naphtha, V. M. & P. deod, steel bbls. | gal. | .18 – | ..... |
| Kerosene, ref. tank wagon | gal. | .13 – | ..... |
| Bulk, W.W. delivered, N.Y. | gal. | .08½ – | ..... |
| Lubricating oils: | | | |
| Cylinder, Penn., filtered | gal. | .34 – | $0.35 |
| Bloomless, 30@ 31 grav. | gal. | .25 – | ..... |
| Paraffin, pale 885 vis. | gal. | .15½ – | .16 |
| Spindle, 200, pale | gal. | .22– | .22½ |
| Petrolatum, amber, bbls. | lb. | .04 – | .04½ |
| Paraffine wax (see waxes) | | | |

## Refractories

| | | | |
|---|---|---|---|
| Bauxite brick, 56% $Al_2O_3$, f.o.b. Pittsburgh | 1,000 | $140– | $145 |
| Chrome brick, f.o.b. Eastern shipping points | ton | 45–47 | |
| Chrome cement, 40-50% $Cr_2O_3$ | ton | 23–27 | |
| 40-45% $Cr_2O_3$, sacks, f.o.b. Eastern shipping points | ton | 23.00 | |
| Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks. | 1,000 | 43–46 | |
| 2nd. quality, 9-in. shapes, f.o.b. wks. | 1,000 | 36–40 | |
| Magnesite brick, 9-in. straight (f.o.b. wks) | ton | 65–68 | |
| 9-in. arches, wedges and keys | ton | 80–85 | |
| Silica brick, 9-in. sizes, f.o.b. Chicago district | 1,000 | 48–50 | |
| 9-in. sizes, f.o.b., Birmingham | 1,000 | 45–47 | |
| F.o.b. Mt. Union, Pa. | 1,000 | 40–42 | |
| Silicon carbide refract brick, 9-in. | 1,000 | 1,180.00 | |

## Ferro-Alloys

| | | | |
|---|---|---|---|
| Ferrotitanium, 15-18% f.o.b. Niagara Falls, | ton | $200.00 – | ..... |
| Ferrochromium, per lb. of Cr, 1-2% C. | lb. | .30 – | ..... |
| 4-6% C. | lb. | .10½ – | .11 |
| Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid | gr. ton | 115.00 – | |
| Spiegeleisen, 19-21% Mn. | gr. ton | 32.00 – | 33.00 |
| Ferromolybdenum, 50-60% Mo, per lb. Mo. | lb. | 1.80 – | 2.00 |
| Ferrosilicon, 10-12% | gr. ton | 39.50 – | 43.50 |
| 50% | gr. ton | 72.00 – | 75.00 |
| Ferrotungsten, 70-80% per lb. of W. | lb. | .85 – | .90 |
| Ferro-uranium, 35-50%, of U, per lb. of U. | lb. | 4.50 – | ..... |
| Ferrovanadium, 30-40%, per lb. of V. | lb. | 3.25 – | 4.00 |

## Ores and Mineral Products

| | | | |
|---|---|---|---|
| Bauxite, dom. crushed, dried, f.o.b. shipping points | ton | $5.50 – | $8.75 |
| Chrome ore, Calif. concentrates, 50% min. $Cr_2O_3$ | ton | 21.00 – | 22.00 |
| C.i.f. Atlantic seaboard | ton | 18.50 – | 24.00 |
| Coke, fdry., f.o.b. ovens | ton | 4.75 – | 5.00 |
| Coke, furnace, f.o.b. ovens | ton | 3.50 – | 3.75 |
| Fluorspar, gravel, f.o.b. mines, Illinois | ton | 17.50 – | 18.50 |
| Ilmenite, 52% $TiO_2$ Va. | lb. | .01½ – | ..... |
| Manganese ore, 50% Mn, c.i.f. Atlantic seaport | unit | .39 – | .41 |
| Manganese ore, chemical ($MnO_2$) | ton | 75.00 – | 80.00 |
| Molybdenite 85% $MoS_2$, per lb. Mo $S_2$, N. Y. | lb. | .65 – | .75 |
| Monazite, per unit of $ThO_2$, c.i.f., Atl. seaport | lb. | .06 – | .08 |
| Pyrites, Span., fines, c.i.f. Atl. seaport | unit | .11½ – | .12 |
| Pyrites, Span., furnace size, c.i.f. Atl. seaport | unit | .12 – | ..... |
| Pyrites, dom. fines, f.o.b. mines, Ga. | unrt | .12 – | ..... |
| Rutile, 94@96% $TiO_2$ | lb. | .12 – | .15 |
| Tungsten ore, scheelite, 60% $WO_3$ and over | unit | 9.50 – | 9.75 |
| Tungsten, wolframite, white, 60% $WO_3$ | unit | 9.00 – | 9.10 |
| Uranium ore (carnotite) per lb. of $U_3O_8$ | lb. | 3.50 – | 3.75 |
| Uranium oxide, 96% per lb. $U_3O_8$ | lb. | 12.25 – | 12.50 |
| Vanadium pentoxide, 76% | lb. | 3.00 – | 3.25 |
| Vanadium ore, per lb. $V_2O_5$ | lb. | 1.00 – | 1.25 |
| Zircon, 99% | lb. | .06 – | .07 |

## Non-Ferrous Metals

| | | | |
|---|---|---|---|
| Copper, electrolytic | lb. | $0.14½ – | $0.14½ |
| Aluminum, 98 to 99% | lb. | .27 – | .28 |
| Antimony, wholesale, Chinese and Japanese | lb. | .16½ – | ..... |
| Nickel, 99% | lb. | .31 – | .32 |
| Monel metal | lb. | .32 | |
| Tin, 5-ton lots, Straits | lb. | .57½ | |
| Lead, New York, spot | lb. | .10 | |
| Zinc, spot, New York | lb. | .07975 | |
| Silver (commercial) | oz. | .68½ | |
| Cadmium | lb. | .60– .62 | |
| Bismuth (500 lb. lots.) | lb. | 1.30–1 35 | |
| Cobalt | lb. | 2.50–3.00 | |
| Magnesium, ingots, 99% | lb. | .90–95 | |
| Platinum, refined | oz. | 117 00 | |
| Mercury .75 | lb. | 82.00–83.00 | |
| Tungsten powder | lb. | .95–1.00 | |

# Industrial Developments of the Week

***New Construction and Machinery Requirements in the Process Industries***

## Some Opportunities This Week

**Ammonia, Blueing**.....Los Angeles, Calif.
**Alcohol**.....Philadelphia, Pa.
**Brass**.....Cleveland, O.
**Chemicals**.....Kingsport, Tenn.
**Chemicals**.....Martinez, Calif.
**Cotton Oil**.....Amarillo, Tex.
**Creosoting**.....Long Beach, Calif.
**Felspar**.....West Paris, Me.
**Gas**.....Durango, Colo.
**Gasoline**.....Eastland, Tex.
**Glass**.....Lancaster, O.
**Glass**.....Hull, Que.
**Gum**.....Oakland, Calif.
**Lime**.....Calera, Ala.
**Paint, Oils**.....Cleveland, O.
**Rubber**.....Fairfield, Conn.

This page is of value not only as a machinery market but also as an index of the general activity and growth of the industries served by Chem. & Met. The reports are gathered by our regular correspondents who are instructed to verify every detail. Requirements for new machinery will be published here free of charge.

### *New England*

**Conn., Fairfield**—E. I. Dupont Fabricoid Co., Mill Plain Rd., awarded contract for the construction of two buildings, one, 45x100 ft., and one 15x30 ft. for the manufacture of rubber goods, on Mill Plain Rd., to T. J. Pardy Construction Co., 1481 Seaview Ave., Bridgeport. Estimated cost $17,000. Private plans.

**Me., West Paris**—The Oxford Mining and Milling Co., Portland, are constructing a 48x98 ft. grinding mill, to have an annual output of 6,000 tons. The plant will be equipped with complete machinery for the grinding of felspar.

**Mass., Brighton** (Boston P. O.)—Cambridge Cement Stone Co., 156 Lincoln St., plans alterations and additions to plant. Estimated cost $40,000. Private plans.

**Mass., Everett**—Beacon Oil Co., 111 Devonshire St., awarded contract for the construction of a 2 and 3 story addition, to plant on Beacham St. to Bond Bros., 79 Ferry St. Estimated cost $50,000. Private plans.

**Mass., Monson**—Rubber Wheel Co., will build a 1 story, 35x70 ft. plant addition, by day labor. Private plans.

### *Middle Atlantic*

**Md., Brooklyn**—General Refractories Co., 7th and Chesapeake Sts., will build a 1 story addition. Estimated cost $8,000. Winkleman Engle, is architect.

**Pa., Philadelphia**—Publicker Commercial Alcohol Co., Swanson and Delaware Aves., will soon award contract for the construction of 2 buildings, 4 story, 70x70 ft. and 5 story 22x32 ft., first units, for storage and still, on Bigler St. C. E. Wander, 1520 Locust Pl., is architect.

### *South*

**Ala., Calera**—The Alabama Lime Co., Birmingham, J. H. Adams, Pres., will purchase machinery to the amount of approximately $750,000, for installation in new lime manufacturing plant, for which contract has recently been awarded. Total estimated cost $1,500,000.

**Tenn., Kingsport**—Tennessee Eastman Kodak Corporation, plans the construction of an addition to chemical plant. Complete machinery for reduction of chemicals and byproducts from wood, will be required. Estimated cost $500,000.

### *Middle West*

**O., Cleveland**—The Central Brass Manufacturing Co., E. A. Eckhouse, Pres., 1900 Euclid Ave., awarded contract for the construction of a 3 story, 63x122 ft. factory, on East 55th St. to Bolton Pratt Construction Co., 7113 Euclid Ave. Estimated cost $125,000.

**O., Cleveland**—The Tropical Paint and Oil Co., R. B. Robinette, Secy. and Treas., 1246 West 70th St., is having plans prepared for the construction of a 3 story, 40x80 ft. factory, also a 1 story, 80x120 ft. office building, here. Estimated cost $75,000. G. S. Rider & Co., Century Bldg., are architects.

**O., Lancaster**—The Hocking Glass Co., c/o T. J. Collins, Pres., awarded contract for the construction of a 1 story, 40x200 ft. factory, to Austin Co., 16112 Euclid Ave., Cleveland. Estimated cost $60,000.

### *West of Mississippi*

**Colo., Durango**—P. A. Little, White Building, Buffalo, N. Y., is considering the construction of a natural gas plant here. Estimated cost $500,000.

**Tex., Amarillo**—C. C. Littleton, Gainsville, is having plans prepared for the construction of a 2 story, cotton oil mill here. Estimated cost $150,000. Complete machinery to be purchased. Private plans.

**Texas, Eastland**—Consolidated Gasoline Co., is having plans prepared for the construction of a 2 story, casinghead gasoline plant, here. Estimated cost $300,000. Private plans. Complete machinery to be purchased.

**Tex., Memphis**—Rosamond & Lokey is having plans prepared for the construction of a cotton burr extractor plant, here. Estimated cost $75,000. Private plans. Owners will purchase machinery.

**Tex., Mexia Humphreys**—Boyd Oil Co., is having plans prepared for the construction of a gasoline manufacturing plant. Estimated cost $150,000. Private plans. Owners will purchase equipment.

### *Far West*

**Calif., Corona**—Corona Silicate Sand Co., awarded contract for the construction of a 1 story, 30x60 ft. sand cleaning plant, to the South Western Engineering Co., Hollingsworth Bldg, Los Angeles. Estimated cost $40,000.

**Calif., Long Beach**—J. H. Baxter & Co., 108 West 6th St., Los Angeles, plans the construction of a creosoting plant on Long Beach Harbor front. Estimated cost $150,000.

**Calif., Los Angeles**—Goodwin Co., 625 South Eastlake Ave., manufacturers of ammonia, blueing, etc., awarded contract for a 1 story, 32x84 ft. factory on Marengo Ave. to R. Roberts, 5249 Loleota St., Eagle Rock, Cal.

**Calif., Martinez**—Chipman Chemical Co., plans the construction of chemical plant buildings to replace those recently destroyed by fire. Estimated cost $100,000.

**Calif., Oakland**—Oakland Gum Co., 385-2nd St., awarded contract for the construction of a 1 story factory building in Adeline St., to Beckett Wight, 2457 Webster St., Berkeley, Cal. $40,000.

**Calif., Stockton**—Western States Gas and Electric Co., is having plans prepared for improvements in the San Joaquin Valley, including a gas plant. Total estimated cost $2,000,000.

**Wash., Seattle**—Doran Brass Foundry, 75 Horton St., plans the construction of a 2 story, 70x100 ft. factory building, here.

### *Canada*

**Ont., Collingwood**—Bd. of Education, A. McFaul, Chm. plans the construction of a collegiate building, including physics and chemistry laboratories. Estimated cost $195,000. J. Wilson, Collingwood is architect. Equipment for laboratories will be required.

**Que., Hull**—The Canada Glass Products, Ltd., have purchased a building here for the installation of plant. New machinery and parts will be required. G. F. Pese, is engineer.

### *Unverified*

**Va., Clinchfield**—Lazote, Inc., organized by E. I du Pont de Nemours & Co., Wilmington, Del, has recently acquired a site here and plans the construction of a plant for the manufacture of synthetic ammonia, with a capacity of 25 tons a day.

### *Incorporations*

Petroleum Chemical Corporation, organized by the Barnsdell Corporation, for the manufacture of alcohol from petroleum residue. Arthur D Little, Inc., Cambridge, Mass., is interested.

Alden Paint Supply Co., Springfield, Mass., paint supplies, $50,000. P. M. Alden, Chicopee; H. M. McMaster, Holyoke; F. Kupper, Springfield.

Minerals Improvement Co., Inc., New York City, metallurgical operations; 1,000 shares preferred stock at $50 par value, and 5,000 shares common stock with no par value. J. A. Conway, 605 West 137th St.; A. Von Bredow, 211 West 105th St., N. Y. City; J. L. Robinson, Upper Montclair, N. J.

Essex Gelatine Company, Boston, Mass., gelatine, glue, sandpaper, hair, patents and patent processes, $400,000. F. Crocker, Malden; F. Bassett, Newton; C. Benjamin, Watertown.

Hastings & Schoen, Springfield, Mass., brass foundry and pattern manufacturers, $45,000. C. Hastings, West Springfield, and I. Schoen, A. Scott, Springfield.

Astra Co., Wilmington, Del., manufacture and refine petroleum, $1,000,000. (U. S. Corporation).

Calaveras Cement Co., Wilmington, Del., $14,000,000. (Corporation Trust Co. of America.)

Tyte Products, Wilmington, Del., insulating, water rustproof chemicals, $105,000. (Corporation Trust Co. of America.)

Ever-Brite Products Co., Wilmington, Del., manufacture tarnishproof compositions, $250,000. F. L. Mettler, Wilmington.

Considine & Co., Inc., Wilmington, Del., paper, $150,000.

Skilton Hide Co., Boston, Mass., hide and leather, $100,000. R. N. Skilton, M. S. Stearns, Cambridge; P. F. Crowley, Lynn.

Union Color and Chemical Co., Boston, Mass., dyes and chemicals, $100,000. J. L. Barrington, Lexington; L. G. Hayes, Medford; C. W. Herrick, Malden.

W. A. Miller Co., Inc., Cambridge, Mass., sugar and confectionery, $30,000. H. W. Moulton, M. F. Moulton, Winchester; E. J. Hyland, Cambridge.

Antiseptic Products, Wilmington, Del., manufacturers, $190,000. (Corporation Trust Co. of America).

Ford Rubber Co., Wilmington, Del., automobile tire manufacturers, $100,000.

Glasgow Consolidated Oil and Refining Co., Wilmington, Del., $300,000. (Lawyers Corporation Co.)

Water Bros., Inc., Wilmington, Del., drugs and chemicals, $550,000.

Lewmar Paper Co., Newark, N. J., paper manufacturers, $125,000. M. G. Alenick, Newark.

Monarch Roofing and Paint Co., Inc., Jersey City, N. J., $50,000. (Cullum and Duff, West Hoboken.)

Star Fish and Bone Fertilizer Co., fertilizer, Bridgeton, N. J., $50,000. John A. Casarow.